CABLETRON SYSTEMS
The Complete Networking Solution™

SmartCell 6A000 User Guide

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Part Number 04-0045-02 Rev-A
Order Number 9032539

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Application of Council Directive(s):	89/336/EEC 73/23/EEC
Manufacturer's Name:	Cabletron Systems, Inc.
Manufacturer's Address:	35 Industrial Way P. O. Box 5005 Rochester, NH 03866
Product Name:	SmartCell 6A000
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Conformance to Directive(s)/Product Standards:	EC Directive 89/336/EEC EC Directive 73/23/EEC EN 55022 EN 50082-1 EN 60950
Equipment Type/Environment:	Networking Equipment, for use in a Commercial or Light Industrial Environment.

We the undersigned, hereby declare, under our sole responsibility, that the equipment packaged with this notice conforms to the above directives.

Manufacturer:	Full Name:	**Mr. Ronald Fotino**
	Title:	**Principal Compliance Engineer**
	Location:	**Rochester, NH. U.S.A.**
Legal Representative in Europe:	Full Name:	**Mr. J. Solari**
	Title:	**Managing Director - E.M.E.A.**
	Location:	**Newbury, Berkshire, England**

SAFETY INFORMATION
CLASS 1 LASER TRANSCEIVERS

The 6A-IOM-29-4, 6A-IOM-29-4-IR, 6A-IOM-29-4-LR, 6A-IOM-39-1 and 6A-IOM-39-1-LR connectors use Class 1 Laser transceivers. Read the following safety information before installing or operating the 6A-IOM-29-4.

The Class 1 Laser transceivers use an optical feedback loop to maintain Class 1 operation limits. This control loop eliminates the need for maintenance checks or adjustments. The output is factory set, and does not allow any user adjustment. Class 1 Laser transceivers comply with the following safety standards:

- 21 CFR 1040.10 and 1040.11 U. S. Department of Health and Human Services (FDA)
- IEC Publication 825 (International Electrotechnical Commission)
- CENELEC EN 60825 (European Committee for Electrotechnical Standardization)

When operating within their performance limitations, laser transceiver output meets the Class 1 accessible emission limit of all three standards. Class 1 levels of laser radiation are not considered hazardous.

LASER RADIATION AND CONNECTORS

When the connector is in place, all laser radiation remains within the fiber. The maximum amount of radiant power exiting the fiber (under normal conditions) is -12.6dBm or 55×10^{-6} watts.

Removing the optical connector from the transceiver allows laser radiation to emit directly from the optical port. The maximum radiance from the optical port (under worst case conditions) is 0.8 W cm^{-2} or 8×10^{3} W m^{-2} sr-1.

Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, you must remove power from the network adapter.

FIBER OPTIC PROTECTIVE CAPS

Caution READ BEFORE REMOVING FIBER OPTIC PROTECTIVE CAPS.

Cable assemblies and MMF/SMF ports are shipped with protective caps to prevent contamination. To avoid contamination, replace port caps on all fiber optic devices when not in use.

Cable assemblies and MMF/SMF ports that become contaminated may experience signal loss or difficulty inserting and removing cable assemblies from MMF/SMF ports.

Contamination can be removed from cable assemblies by

- Blowing surfaces with canned duster (Chemtronics p/n ES1270 or equivalent).
- Using a fiber port cleaning swab (Alcoa Fujikura LTS p/n ACT-01 or equivalent) saturated with optical-grade isopropyl alcohol, gently wipe the end surface of ferrules first; then wipe down the sides of both ferrules.
- Blow ferrule surfaces dry with canned duster.

Contamination can be removed from MMF/SMF ports by

- Using the extension tube supplied with canned duster, blow into the optical port, being careful not to allow the extension tube to touch the bottom of the optical port.
- Reconnect cable and check for proper mating. If problems remain, gently wipe out optical port with a DRY fiber port cleaning swab and repeat step 1.

Caution To avoid contamination, replace port caps on all fiber optic devices when not in use.

REGULATORY COMPLIANCE SUMMARY

SAFETY

The SmartCell 6A000 meets the safety requirements of UL 1950, CSA C22.2 No. 950, EN 60950, IEC 950, and 73/23/EEC.

EMC

The SmartCell 6A000 meets the EMC requirements of FCC Part 15, EN 55022, CSA C108.8, VCCI V-3/93.01, EN 50082-1, and 89/336/EEC.

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1 INTRODUCTION

Welcome to the SmartCell 6A000 User Guide. The SmartCell 6A000 ATM switch is a module that fits into the SmartSwitch 6000 chassis. You can install as many as five SmartCell 6A000 switches into a SmartSwitch 6000 chassis (using the 6C305-3 power supply). The module is hot swappable, meaning that you can install and remove it without turning off or disconnecting the chassis. This manual will help you quickly and easily install and configure your SmartCell 6A000 switch.

By performing the steps described in the first two chapters of this manual, your switch will be physically installed, accessible on your Ethernet network, and running either an IP over ATM VLAN or an emulated Ethernet or Token Ring LAN.

Subsequent chapters provide information about switch use, maintenance, and problem solving. These topics include

- Managing the switch: backing up configurations, adding routes, creating PVC connections, upgrading software, dealing with bandwidth, and controlling congestion
- Working with the switch's hardware components
- Troubleshooting

Note For detailed descriptions of SmartCell 6A000 console commands and their use, see the SmartCell 6A000/ZX-250 Reference Manual.

2 SWITCH INSTALLATION AND SETUP

After you read this chapter, you will be able to perform the following tasks:

- Install the SmartCell 6A000 switch module into the SmartSwitch 6000 chassis
- Complete the initial configuration
- Use the console interface
- Install the SmartSwitch ATM Administrator graphical management software

2.1 UNPACKING THE SWITCH

Remove the accessory carton from the shipping box. Carefully remove the switch from its packing material.

2.1.1 Check Accessory Carton Contents

Open the accessory carton and check that it contains the following items:

— 7-foot UTP cable terminated on both ends with RJ-45 connectors

— RJ-45 to 9-pin female adapter (labeled PC)

— Console cabling instruction sheet

— Diskettes containing switch software, MIB files, SmartSwitch ATM Administrator software, and release notes

— SmartCell 6A000 Release Notes

— SmartCell 6A000 User Guide

— SmartCell 6A000/ZX-250 Reference Manual

If any of these items is missing, contact Cabletron customer support immediately.

2.2 INSPECTING THE SWITCH

Depending on the configuration ordered, your switch looks similar to one of the units in the drawing in Figure 2-1. The 6A000-04, shown on the left, has four I/O modules. The 6A000-02, shown on the right, has two I/O modules; the empty I/O module positions are covered by metal blanks.

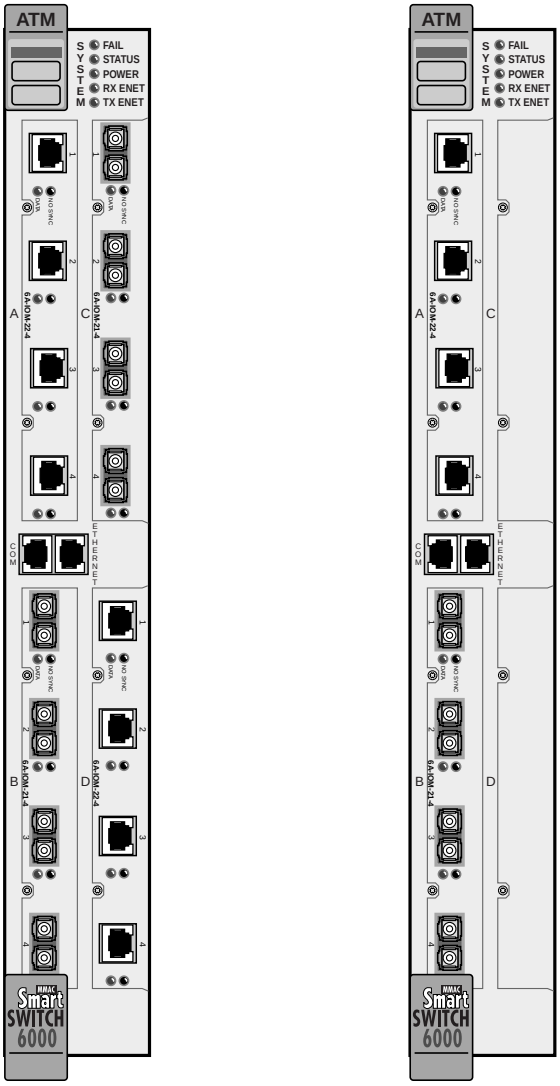

Figure 2-1 6A000-04 and 6A000-02 front panels

Inspect the switch and make certain that its configuration corresponds to what was ordered. Also, make certain that the input/output (I/O) modules are of the correct type and number (See Table 2-1).

Table 2-1 I/O module ID numbers

Face Plate Number	Physical Specification
6A-IOM-21-4	155 Mbps OC-3/STM-1, MMF/SC (4 port)
6A-IOM-22-4	155 Mbps STS-3c/STM-1, UTP-5/RJ-45 (4port)
6A-IOM-29-4	155 Mbps OC-3/STM-1, SMF-IR/SC (1port) MMF/SC (3 port)
6A-IOM-29-4-IR	155 Mbps OC-3/STM-1, SMF-IR/SC (4 port)

Table 2-1 I/O module ID numbers (Continued)

Face Plate Number	Physical Specification
6A-IOM-29-4-LR	155 Mbps OC-3/STS-1, SMF-LR/SC (4 port)
6A-IOM-31-1	622 Mbps OC-12/STM-4, MMF/SC (1 port)
6A-IOM-39-1	622 Mbps OC-12/STM-4, SMF-IR/SC (1 port)
6A-IOM-39-1-LR	622 Mbps OC-12/STM-4, SMF-LR/SC (1 port)
6A-IOM-67-4	45 Mbps DS-3, Coax/BNC (4 port)
6A-IOM-77-4	34 Mbps E-3, Coax/BNC (4 port)

If the hardware configuration is incorrect, contact Cabletron customer support immediately.

2.2.1 DS3 and E3 I/O Module Configuration

Table 2-2 shows the pre-configured values for both the DS3 (6A-IOM-67-4) and E3 (6A-IOM-77-4) I/O modules. These values cannot be changed. Accordingly, configure the connecting device's interface to use these values.

Table 2-2 DS3 and E3 Module settings

Protocol	Mode	Framing	Empty Cell	Timing	Scrambling	Length
DS3	plcp	cbit	unassigned	internal	off	greater than 225 ft.
E3	plcp	G.751	unassigned	internal	off	N/A

2.3 INSTALLING THE SWITCH

The SmartCell 6A000 is hot swappable, meaning that you can install and remove it without turning off or unplugging the SmartSwitch 6000 chassis. You can install as many as five switch modules in each chassis (using the 6C205-3 power supply). In this configuration, the SmartCell 6A000 modules provide up to 75 user ports. Modules should be connected with inter-module trunks if traffic must cross between modules. Table 2-3 shows the maximum number of LAN and ATM switch modules that can be installed in a SmartSwitch 6000 chassis.

Table 2-3 SmartSwitch 6000 contents

Number of 6Exxx or 6Hxxx modules installed	0	1	2	3	4	5
Number of 6A000 modules that can be added	5	4	3	2	1	0

Note A single 6C205-1 power supply (the older version of the 6C205-3) can support only two SmartCell 6A000s within a SmartSwitch 6000 chassis. Three SmartCell 6A000s can reside within a SmartSwitch 6000 chassis that contains two 6C205-1 power supplies.

Follow the instructions below to install the switch module into the chassis. Refer to Figure 2-2.

1. Remove the metal blank that covers one of the empty slots in the chassis.
2. Open the ejectors at the top and bottom of the switch module.
3. With the LEDs at the top, align the top and bottom of the SmartCell 6A000 with the tracks in the slot.
4. Slide the switch into the chassis. The switch module obscures the view of the tracks at the bottom of the chassis, so be sure to look at that area as you begin to slide the switch into the chassis.
5. Close the ejectors. The installation is complete.

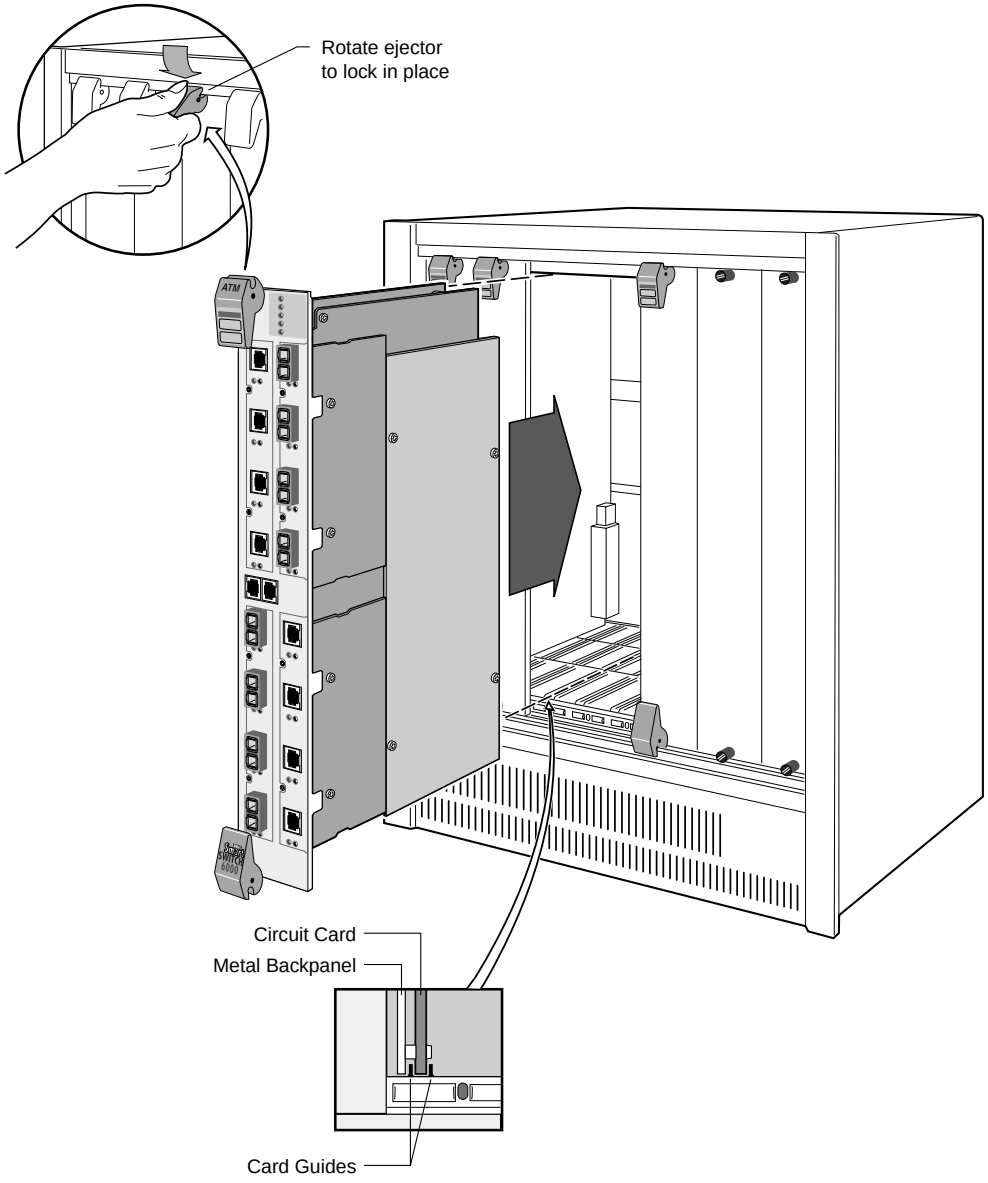

Figure 2-2 Installing the SmartCell 6A000

2.4 CONFIGURING THE SWITCH

Initial configuration of your SmartCell 6A000 switch consists of setting the name, Ethernet IP address, and subnet mask. Once these tasks are complete, the switch can be reached through your Ethernet network for additional configuration and administration.

Perform the following steps to configure initial switch parameters:

1. Determine whether you will use a dumb terminal, workstation, or PC running terminal emulation software to perform initial switch configuration.

2. Configure dumb terminals or PCs running emulation software with the following communication parameters:

- Baud rate = 9600
- Data bits = 8
- Stop bits = 1
- Flow control = none

3. Plug one end of the supplied RJ-45 UTP cable into the 9-pin RJ-45 adapter (see Figure 2-3)

Note For information about adapter wiring configurations, see Appendix A, "Specifications."

4. Plug the other end of the UTP cable into the SmartCell 6A000 female RJ-45 jack labeled Terminal, located on the front panel (see Figure 2-3).
5. Connect the switch to your network by plugging a UTP cable into the SmartCell 6A000 female RJ-45 jack labeled Ethernet, located near the center of the switch's front panel (see Figure 2-3).

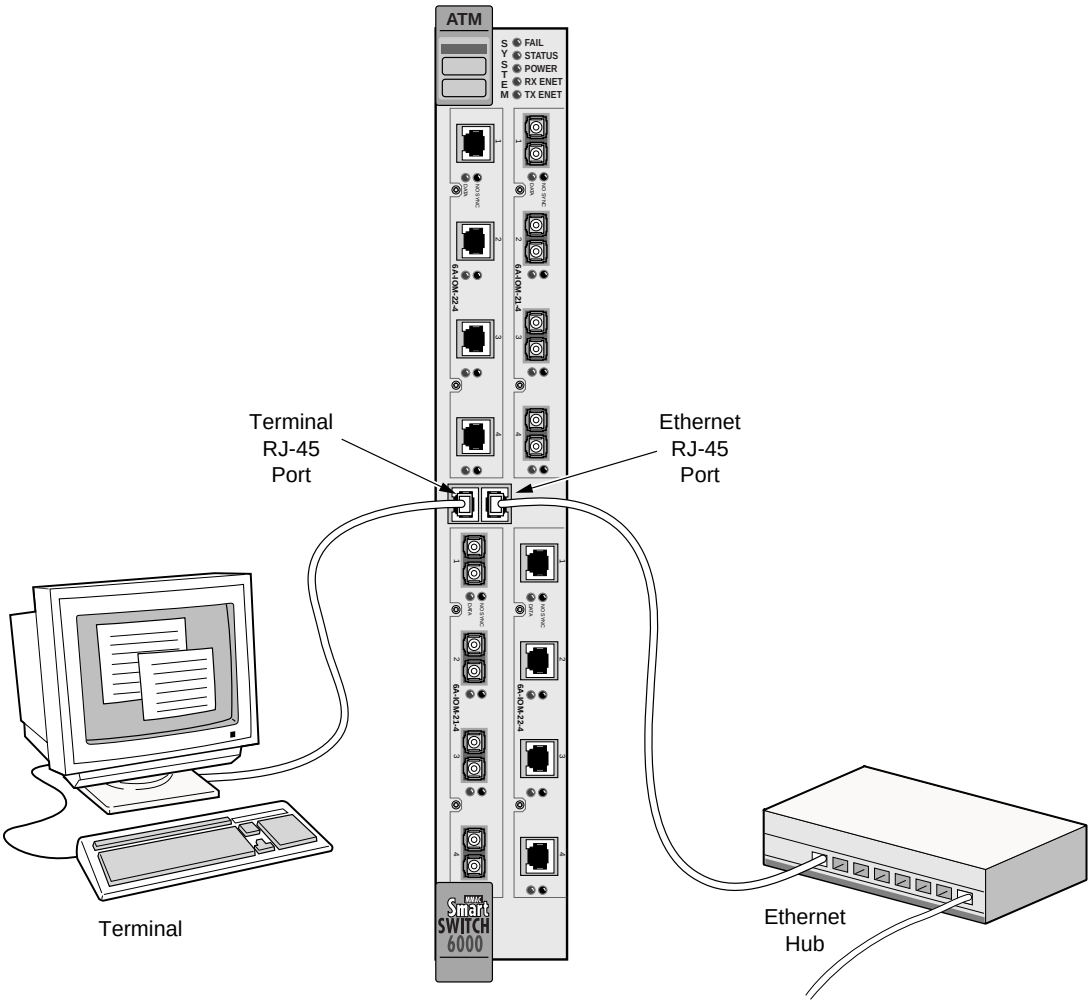

Figure 2-3 6A000 console and network connections

6. Start the dumb terminal or PC and its terminal emulation software.
7. As soon as power is applied to the SmartCell 6A000, the module emits a series of diagnostic messages. If you inserted the module into a chassis that was turned off, turn it on now to see the diagnostics. If you inserted the module into a chassis that was turned on, press the Reset switch to see the diagnostics.
8. After the diagnostics are finished, the switch prompts for a password. Enter the default password, "admin."
9. Next, the switch prompts for the information necessary to make the switch accessible through your Ethernet network

- Switch name
- IP address
- Subnet mask

10. After you enter these parameters and reboot the switch, log off the local console connection. Perform additional configuration steps over your network using a telnet connection.

Note Only one console connection is allowed at any time. To reach the SmartCell 6A000 through telnet, you must exit the local terminal connection by entering the **exit** command.

The following is an example of the initial configuration session:

```
SmartCell ZX Version 2.1 (c) Cabletron Inc.
password:: admin                          <"admin" is the default password
The current user is Administrator
Could not find setup file
Running Setup Automatically
SwitchName() : My_6A000                   < a switch name
IPAddress(0.0.0.0) : 210.160.77.254       < an IP address
IPNetMask(255.0.0.0) : 255.255.255.0      < a subnet mask
Confirm(y/n)?:y
Changing IP Address on System. Telnet session (if any) will be lost.
SmartCell ZX #
```

Before continuing to chapter 3, “IP over ATM and LANE,” read the following sections for information about

- Using the SmartCell 6A000 console
- Installing and getting started with the Windows-based SmartSwitch ATM Administrator application

2.5 USING THE CONSOLE

Use the SmartCell 6A000 console interface to configure and manage your switch. The following is a description of the console interface and its operation.

2.5.1 Console Commands

Note For detailed descriptions of console commands, see the SmartCell 6A000/ZX-250 Reference Manual.

All console commands use the syntax:

operator switch-attribute [<parameter 1> <parameter 2>... <parameter n>]

Where the operator is one of the following:

show (**display**): Show the current values used by a switch-attribute.

add (**create**): Add a new instance of a switch-attribute.

delete (**remove**): Delete an instance of a switch-attribute.

modify (**set**): Change the values that currently define a switch-attribute.

start: Start a process on the switch; for example, start the LAN Emulation Configuration Server.

restart: Restart a process on the switch; for example, restart a client.

flush: Remove assigned values; for example, flush a route table.

alias: Create easier names for often-used commands and their parameters.

Entering parameters at the command line is optional. If a command requires parameter values, it prompts you for them. For instance, in the example below, **show** is the operator, **portconfig** is the switch-attribute, and **a1** is the parameter indicating that you want to show configuration information about port **A1**.

```
SmartCell ZX # show portconfig a1
================================================
 Port: A1
 ------------------------------------------------
 Parameter              Configured     Current
 ------------------------------------------------
 Sig Type                autoConfig     pnni10
 Sig Role                other          symmetric
 Interface Type          private        private
 Max vpi bits            0              0
 Max vci bits            12             12
 Max SVC vpci            0              0
 Min SVC vci             32             32
 Max Vccs                4096           4096
 ------------------------------------------------
 Other parameters
 ------------------------------------------------
 Port Admin Status       UP
Ilmi Admin Status       Enabled AddressRegistration Connectivity
 Oper State              UP
 Trans Type              STS-3c
 Media Type              MMF (S)
 Bandwidth               155 MB
SmartCell ZX #
```

If you don't specify parameters with the command, the console prompts you for an input value and provides a default value displayed in parenthesis. For example, if you enter **show portconfig** without specifying a port (as a parameter), the following appears. Here, the default of "**all**" ports is presented. You can either accept the default by pressing Enter, or you can enter a specific port number. Taking the default displays the following:

```
SmartCell ZX # show portconfig
PortNumber(ALL)                          :
Port    Intf      Sig          Trans   Media     Speed     Oper
ID      Type      Type         Type    Type      (MB/s)    State
================================================================================
A1      private   pnni10       STS-3c  MMF (S)   155 MB    UP
A2      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
A3      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
A4      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
B1      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
B2      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
B3      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
B4(CPU) private   uni31        STS-3c  MMF (S)   155 MB    UP
C1      private   autoConfig   STS-3c  SMF (I)   155 MB    DOWN
C2      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
C3      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
C4      private   autoConfig   STS-3c  MMF (S)   155 MB    DOWN
D1      private   autoConfig   STS-3c  CAT5 UTP  155 MB    DOWN
D2      private   autoConfig   STS-3c  CAT5 UTP  155 MB    DOWN
D3      private   autoConfig   STS-3c  CAT5 UTP  155 MB    DOWN
D4      private   autoConfig   STS-3c  CAT5 UTP  155 MB    DOWN
SmartCell ZX #
```

Note When you accept the (**all**) default for **show**, the information displayed is often abridged.

2.5.2 Console Time-out

The console can be configured to exit if it does not sense a key stroke within a defined length of time. By default, the SmartCell 6A000 is set to never time-out (value = 0). To activate the time-out feature, use the **set ConsoleTimeOut** command to adjust the time-out period:

```
SmartCell ZX # set consoletimeout
Timeout(0)                              : 30 <Will time-out in 30 minutes without input
Confirm (y/N)? : y
SmartCell ZX #
```

2.5.3 Creating an Alias

Use the **add alias** command to create shorter or easier-to-remember names for command lines. For example:

```
SmartCell ZX # add alias
AliasName()                             : traffic
AliasedString()                         : set switchtrafficcongestion
SmartCell ZX #
```

The above example creates an alias (**traffic**) that can be entered in place of the command **set SwitchTrafficCongestion**. For example:

```
SmartCell ZX # traffic
Queue1EFCIThreshold(4096)               :
Queue2EFCIThreshold(4096)               :
Queue3EFCIThreshold(4096)               :
Queue4EFCIThreshold(4096)               :
LowEPDWatermark(10922)                  :
HighEPDWatermark(21845)                 :
RMCellMarkingEnable(1)                  :
EFCIMarkingEnable(1)                    :
SmartCell ZX #
```

Enter the **show alias** command to display a list of all defined aliases and the command lines to which they correspond.

```
:SmartCell ZX # show alias
AliasName(ALL)                          :
Alias List
================================================================================
 Index Alias Name                       : Aliased Command
 1     PING                             : Start ping
 2     xxx                              : show portconfig
 3     traffic                          : set switchtrafficcongestion
SmartCell ZX #
```

2.5.4 Ambiguous Commands

If you enter part of a command, and that part is not unique, the console displays a numbered list of possible matching commands. For example, entering **`show pnnin`** is ambiguous because there are several commands that start with "pnnin." In response, the SmartCell 6A000 displays a list of the possible commands:

```
SmartCell ZX # show pnnin      < "pnnin" is ambiguous
Objects beginning with pnnin for action show
0  :    PnniNeighbor
1  :    PnniNetworkLink
2  :    PnniNetworkNode
3  :    PnniNode
4  :    PnniNodeTimer
(#)Command  (Q)uit? : 3       < I meant PnniNode, so I enter number three (3) from the list
SmartCell ZX # show PnniNode
```

Selecting number three from the list automatically enters the corresponding command; pressing enter executes the command:

```
PNNI Node Information
================================================================================
Level        : 80
Node Id      : 50:a0:39:00:00:00:00:00:00:00:00:28:c1:80:00:20:d4:28:c1:80:00
Lowest       : TRUE
Admin Status : UP
Oper Status  : UP
Atm Address  : 39:00:00:00:00:00:00:00:00:00:28:c1:80:00:20:d4:28:c1:80:00
Peer Group Id: 50:39:00:00:00:00:00:00:00:00:00:00:00
Rst Transit  : FALSE
Rst Branching: FALSE
DB Overload  : FALSE
Ptse         : 2
SmartCell ZX #
```

2.5.5 Console Help

The console provides several levels of help for console commands. For example, to list the switch attributes that can be used with a particular operator, enter the word **`help`** (or **`?`**) followed by the operator.

```
SmartCell ZX # help add
HELP  ----    add
================================================================================
add          [ AlarmConfig | Alias | ATMRoute | BUSELAN | Community | ELAN |
             Interface | IPATMClient | IPATMPVC | LANEClient | LECSELAN |
             LECSELANLEC | LECSTLVSET | LESELAN | NetPrefix | PnniMetrics |
             PnniSummaryAddress | PVC | Route | ServiceRegistry |
             TrafficDescriptor | TrapCommunity ]
SmartCell ZX #
```

To obtain an explanation of a command and its parameters, enter the word help (or ?) before the command.

```
SmartCell ZX # ? add laneclient
Create LANE Client
================================================================================
ClientNumber             Local Client Number (0-127)
LanName                  Name of the ELAN to join
ServerType               Type of LANE Server [LECS, LES]
ServerAddress            ATM Address of the LANE Server
IPAddress                IP Address of the Client
NetMask                  IP Netmask of the Client
MTU                      MTU for the Client [1516, 9234, NONE]
SmartCell ZX #
```

While entering a command, you can obtain help about the current parameter by entering a question mark (?) at the prompt. For example:

```
SmartCell ZX # add atmroute
PortNumber(A1)                          : a3
AtmAddress()                            : 39:00:00:00:00:00:00:00:00:00:14:72:80
PrefixLength(104)                       :
Index(0)                                :
Type(Internal)                          : ?
The type of reachability. Use Internal, Exterior, or Reject.
Type(Internal)                          :exterior
Scope(0)                                :
MetricsTag(0)                           :
SmartCell ZX #
```

Note Press the Esc key to back out of any command before you enter the last value.

2.6 SMARTSWITCH ATM ADMINISTRATOR

SmartSwitch ATM Administrator is a Windows application that manages SmartCell ATM switches. It supports the following operations:

- Switch management
- Emulated Local Area Network (ELAN) management
- Connection management
- Alarm management
- Switch discovery

Additionally, the SmartSwitch ATM Administrator provides the following capabilities that are not available from the console interface:

- Use a graphical user interface
- Perform drag and drop operations
- Manage all switches from one console
- Perform transactions across multiple switches (for example, create an ELAN when the servers are not co-located

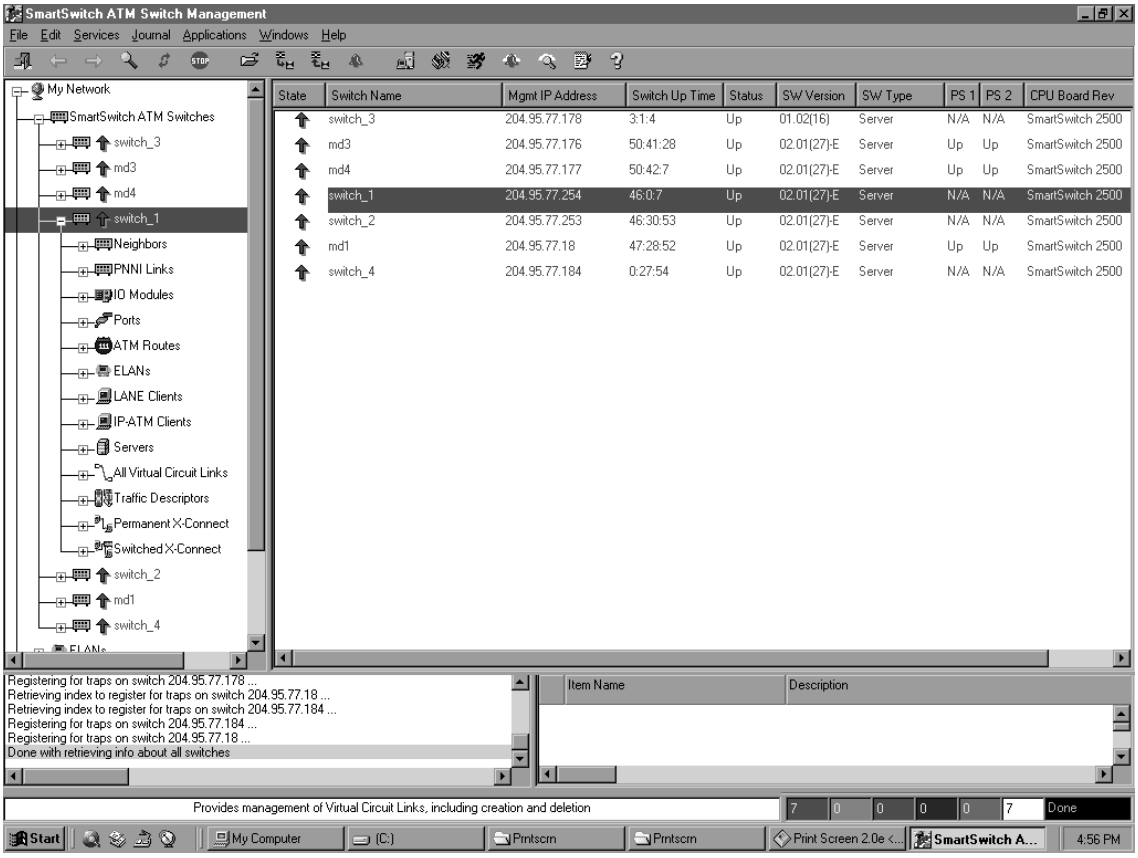
SmartSwitch ATM Switch Management
File Edit Services Journal Applications Windows Help
My Network
SmartSwitch ATM Switches
switch_3
md3
md4
switch_1
Neighbors
PNNI Links
IO Modules
Ports
ATM Routes
ELANs
LANE Clients
IP-ATM Clients
Servers
All Virtual Circuit Links
Traffic Descriptors
Permanent X-Connect
Switched X-Connect
switch_2
md1
switch_4
State Switch Name Mgmt IP Address Switch Up Time Status SW Version SW Type PS 1 PS 2 CPU Board Rev
switch_3 204.95.77.178 3:1:4 Up 01.02(16) Server N/A N/A SmartSwitch 2500
md3 204.95.77.176 50:41:28 Up 02.01(27)-E Server Up Up SmartSwitch 2500
md4 204.95.77.177 50:42:7 Up 02.01(27)-E Server Up Up SmartSwitch 2500
switch_1 204.95.77.254 46:0:7 Up 02.01(27)-E Server N/A N/A SmartSwitch 2500
switch_2 204.95.77.253 46:30:53 Up 02.01(27)-E Server N/A N/A SmartSwitch 2500
md1 204.95.77.18 47:28:52 Up 02.01(27)-E Server Up Up SmartSwitch 2500
switch_4 204.95.77.184 0:27:54 Up 02.01(27)-E Server N/A N/A SmartSwitch 2500
Registering for traps on switch 204.95.77.178 ...
Retrieving index to register for traps on switch 204.95.77.18 ...
Retrieving index to register for traps on switch 204.95.77.184 ...
Registering for traps on switch 204.95.77.184 ...
Registering for traps on switch 204.95.77.18 ...
Done with retrieving info about all switches
Item Name
Description
Provides management of Virtual Circuit Links, including creation and deletion
Done
Start
My Computer
(C:)
Prntscrn
Prntscrn
Print Screen 2.0e <...
SmartSwitch A...
4:56 PM

Figure 2-4 SmartSwitch ATM Administrator

Note Capabilities that are not available from the SmartSwitch ATM Administrator are debugging and tracing.

SmartSwitch ATM Administrator can be installed on a PC running Windows NT 4.0, Windows NT 3.51, or Windows 95, and requires the following PC hardware configuration:

- Pentium 133 Mhz or faster processor
- 20 MB disk space
- 32 MB RAM
- Monitor with resolution of at least 800 x 600 pixels
- Network connections (either Ethernet or ATM) to the switches you manage

2.6.1 Installation Steps

The installation process for SmartSwitch ATM Administrator is essentially the same for all the supported operating systems. Follow these instructions for installation on NT 4.0, NT 3.5.1, or Win95.

1. If you are using diskettes, make backup copies of the SmartSwitch ATM Administrator diskettes. Put the original diskettes in a safe place; use them if your backup copies become unusable. Use your backup copies to complete the installation procedure.
2. Load Disk 1 into drive **a** or note the network <path> to the directory that contains the SmartSwitch ATM Administrator files.
3. Start the installation software:
   - NT 4.0 or Win95, click Start then click Run
   - NT 3.5.1, select the File menu and click Run
4. Enter **`a:\setup.exe`** to install from drive **a:**
   OR **`<path>\Disk1\setup.exe`** to install from the network
5. The Software License Agreement dialog box appears. Follow the instructions on the screen and click Yes to proceed.
6. The Welcome dialog box appears. Read the instructions and click Next to proceed.
7. The Choose Destination Location screen appears. Follow the instructions on the screen and click Next. Setup performs the following tasks:
   - Copies several files to c:\ZXAdmin or to the destination you specified
   - Creates a program group called SmartCell ZX Network Management Tools (Common)
   - Creates icons in the group:

     SmartSwitch ATM Administrator – starts the application

     Online Help – starts the online help

     Readme – displays release notes

     UnInstall SmartSwitch ATM Administrator – removes the application from your PC
8. The Setup Complete dialog box appears. Read the message and click Finish.
9. The Information dialog box appears. Click OK.

2.6.2 Starting SmartSwitch ATM Administrator the First Time

When you use SmartSwitch ATM Administrator for the first time, you should change the default passwords to prevent unauthorized access to the application. The application arrives with two user accounts set up, as described in Table 2-4.

Table 2-4 Default accounts and passwords

User Name	Access Level	Default Password
admin	Administrator	admin
guest	Guest	guest

1. In the SmartCell ZX Network Management Tools (Common) program group, double click on the icon labeled SmartSwitch ATM Administrator. The SmartSwitch ATM Administrator Login dialog box appears.

2. Enter the default user name, **admin**. The user name is case sensitive.
3. Enter the default password, **admin**, and click the OK button or press Enter. The password is case sensitive.
4. The SmartSwitch ATM Administrator window appears. On the Applications menu, select User Management.

2.6.3 Accessing Online Help

All SmartSwitch ATM Administrator operations (including changing passwords and adding users) are documented within the application's online help. Follow these instructions to access the online help facility.

1. From the Help menu, select SmartSwitch ATM Administrator Help Topics.
2. The Help Topics dialog box appears. You have three options for viewing online help:
   - Click the Contents tab to show the Table of Contents of the online help. Click on the topic you wish to read about.
   - Click the Index tab to select from an alphabetical list of help topics.
   - Click the Find tab to search for a particular topic.

3 IP OVER ATM AND LANE

This chapter describes working with the SmartCell 6A000 IP over ATM VLAN and emulated LAN capabilities. At the end of this chapter you will be able to use your SmartCell 6A000 switch to

- Create an IP over ATM VLAN
- Create an emulated Ethernet LAN (LANE)

3.1 CREATING AN IP OVER ATM VLAN

This section describes implementing IP over ATM on your SmartCell 6A000 switch. The following assumptions are made:

- The 6A000 switch will have a client on the IP over ATM VLAN
- The ARP server will reside on the switch and correspond to the address of the switch client
- All end nodes (computers, edge devices, and so on) support Switched Virtual Circuits (SVCs)

1. Log into the switch, either through the terminal port or through the Ethernet interface by telnet.
2. Create a client on the switch and assign it as the ARP server for the VLAN.

```
SmartCell ZX # add ipatmclient
ClientNumber(0) : 1
ServerType(NONE) : local   < the ARP server is assigned to the switch client
ServerAddress()  :
IPAddress()  : 90.1.1.1    < IP address is for example only
NetMask(255.0.0.0) : 255.255.255.0    < subnet mask is for example only
MTU(9180)  :
SmartCell ZX #
```

The example above creates a client on the switch, designates the client as the ARP server for the VLAN (**`ServerType`** = **`local`**), and assigns the client an IP address and subnet mask.

Note The command **`add ipatmclient`** always prompts you with a subnet mask that is appropriate for the IP address. However, if necessary, you can change the subnet mask to correspond to the strategy employed within your networks.

Note Never create an IP over ATM VLAN (or an IP over ATM client) with the same subnet as the SmartCell 6A000 Ethernet port.

3. Enter the **show client** command to make sure the client is operational and to obtain the 20-byte ATM address of the ARP server. For instance, if you used the client number (client 1) from the example in step 2, enter the following command.

```
SmartCell ZX # show client 1
IP/ATM Client 1
================================================================================
Client State      : Operational
Client Address    : 39:00:00:00:00:00:00:00:00:00:14:41:80:00:00:5A:01:01:01:00
Server            : is local
Server Connection : Established
MTU               : 9180
IP Address        : 90.1.1.1
IP NetMask        : 255.255.255.0
SmartCell ZX #
```

4. Physically connect your end nodes and edge devices to the SmartCell 6A000 ports.

Note Your end nodes do not need to be physically attached to the switch that contains the ARP server. For example, an end station is connected to a 6A000 switch that is connected through a route to the switch containing the ARP server . No special configuration is needed for this end station to participate in the VLAN because the end station automatically finds its path across the route to the ARP server and the other VLAN members.

5. Configure the ATM interface or adapter for end nodes and edge devices. Typically, configuration consists of designating IP over ATM as the protocol, assigning the device an IP address, and specifying the 20-byte ATM address of the ARP server (the switch's client address). For details on the SmartCell 6A000 automatic addressing scheme for IP over ATM, see Section 3.1.1.
6. As your end devices are configured and started, they register with the ARP server. You can test whether your IP over ATM VLAN is functional by pinging from one end device to another.

To make certain that all end devices are registered with the ARP server, you can inspect the switch's ARP table using the **show ipatmarp** command. For example, if three end devices with IP addresses 90.1.1.2, 90.1.1.3, and 90.1.1.4 are added to the VLAN, the following ARP table entries should exist:

```
SmartCell ZX # show ipatmarp
ClientNumber(ALL)                        :
IP/ATM Server 1 ARP Table
IP Address         ATM Address
================================================================================
90.1.1.2 39:00:00:00:00:00:00:00:00:00:14:41:80:00:00:5A:01:01:02:00
IP/ATM Server 3 ARP Table
IP Address         ATM Address
================================================================================
90.1.1.3 39:00:00:00:00:00:00:00:00:00:14:41:80:00:00:5A:01:01:03:00
IP/ATM Server 5 ARP Table
IP Address         ATM Address
================================================================================
90.1.1.4 39:00:00:00:00:00:00:00:00:00:14:41:80:00:00:5A:01:01:04:00
SmartCell ZX #
```

Note If configured devices fail to join the VLAN, see Chapter 4, Section 4.2.2, “UNI Routes.” Also, see Chapter 5, Section 5.1, “Troubleshooting IP Over ATM.”

You have completed the process for creating an IP over ATM VLAN. Continue to the next section for instructions on creating an emulated LAN or go to Chapter 4, “Switch Administration,” for information about SmartCell 6A000 switch operations and maintenance.

3.1.1 ATM Addressing for IP over ATM

The SmartCell 6A000 provides a default format for ATM addresses used by IP over ATM. The default format is constructed as follows:

netprefix + two zero bytes + IP address of the device (in hex) + a trailing zero byte

Where the netprefix is constructed from

39 + nine zero bytes + the last three bytes of the device’s MAC address

For instance, if the switch’s MAC address is 00:20:D4:14:41:80 and the switch’s client IP address is 90.1.1.1, then the 20-byte ATM address of the ARP server is

39:00:00:00:00:00:00:00:00:00:00:14:41:80:00:00:5A:01:01:01:00

Where
39:00:00:00:00:00:00:00:00:00:00:14:41:80 = netprefix
00:00 = two trailing zeros
5A:01:01:01 = IP address 90.1.1.1 in hexadecimal
00 = trailing zeros byte

3.2 CREATING AN EMULATED LAN

This section describes the steps for implementing an Ethernet Emulated LAN (ELAN) on your SmartCell 6A000 switch. The following assumptions are made:

- The SmartCell 6A000 switch will contain a client on the ELAN.
- All end nodes (computers, edge devices, other switches, and so on) support the Well Known LECS Address or can obtain the address of the LECS using ILMI.
- All end nodes support Switched Virtual Circuits (SVCs).

Note An ELAN comes pre-configured on SmartCell 6A000 switches. The ELAN name is “ELAN000.” To use this ELAN, start the LECS, configure your end nodes and edge devices to use this ELAN000, and then plug them into the SmartCell 6A000.

1. Enter the **start LECS** command to activate LANE server services on this switch.

```
SmartCell ZX # start lecs
NOTICE - 'LECS' ***** LECS started *****
SmartCell ZX #
```

2. Create an ELAN on your SmartCell 6A000 switch by executing the **add elan** command. The following is an example.

```
SmartCell ZX # add elan
ELANNumber(0) : 1                <1 is used instead of the default, (0)
ELANName(ELAN001): Marketing     <ELAN is named Marketing instead of the default, (ELAN000)
ConnectMethod(SVC):
ELANType(802.3)                  <The default (Ethernet) is used
Multipoint(YES) :
MTU(1516) :
Distribute(PROXY) :
SmartCell ZX #
```

3. Create a client for the switch on the ELAN. For example, enter

```
SmartCell ZX # add laneclient
ClientNumber(0) :1               <One is used instead of the default, (0)
LanName(ELAN001) : Marketing     < ELAN name is Marketing, not the default, (ELAN001)
ServerType(LECS) :
ServerAddress()            <No LANE server address is specified; see note below
IPAddress() : 90.1.1.1     < IP address and subnet mask are included only as examples
NetMask(255.0.0.0): 255.255.255.0
MTU(1516) :
SmartCell ZX #
```

Note The command **add laneclient** always prompts you with a subnet mask that is appropriate for the IP address. However, if necessary, you can change the subnet mask to correspond to the strategy employed within your networks.

Note When you create a client, it automatically finds the LECS address using ILMI.

As the local client joins the ELAN, the following messages are sent to the Event log:

```
NOTICE - 'ZLESSRV'  LES Join 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:
14:41:82:00
NOTICE - 'ZLESSRV'  BUS Connect 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:
14:41:82:00
```

Caution Never create an ELAN (or ELAN client) with the same subnet as the SmartCell 6A000 Ethernet port.

4. Enter the **`show client`** command to make certain that the client is operational.

```
SmartCell ZX # show client 1
LANE Client 1
================================================================================
Client State      : Operational
Client Address    : 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:81:00
LAN Name          : Marketing
LECS Addr Source  : ILMI
LECS Address      : 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:80:01
LES Address       : 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:82:02
LAN Type          : 802.3
MTU               : 1516
IP Address        : 90.1.1.1
IP NetMask        : 255.255.255.0
SmartCell ZX #
```

Note While creating an ELAN client for the switch is not absolutely necessary, it does provide management connectivity with the switch over its ATM ports (instead of the Ethernet port). See Chapter 4, “Switch Administration” for information about how to reach switches not directly connected to the Ethernet network.

5. Physically connect your end nodes and edge devices to the SmartCell 6A000 ports.
6. Configure the ATM interface or adapter for all end nodes and edge devices. Typically, configuration consists of specifying LAN Emulation as the protocol, assigning the device an IP address that corresponds to the subnet of the switch’s client, and indicating that you want the device to either acquire the LECS address through ILMI or use the Well Known Address as the address for the LECS. For details on the SmartCell 6A000 automatic addressing scheme for LANE, see Section 3.2.1.
7. As each end device registers with the LES and BUS, messages are sent to the event log of the SmartCell 6A000 containing the LECS. You can check connectivity by pinging between end nodes.

Note If configured devices fail to join the ELAN, see Chapter 4, Section 4.2.2, “UNI Routes.” Also, see Chapter 5, Section 5.2, “Troubleshooting LAN Emulation.”

Your ELAN is now operational. Additional ELANs can be created in the same way. See Chapter 4, “Switch Administration,” for information about SmartCell 6A000 switch operations and maintenance.

Note While it is possible for a single ELAN on the SmartCell 6A000 switch to support multiple subnets, in general, switch performance is best (and management easiest) when the “One-subnet-per-ELAN” rule is observed.

3.2.1 ATM Addressing for LAN Emulation

The SmartCell 6A000 provides a default format for ATM addresses used by LAN emulation. The default format is constructed as follows:

netprefix + the MAC address of the device + a Selector Byte

Where the netprefix is constructed from

39 + nine zero bytes + the last three bytes of the switch's MAC address

The Selector Byte specifies to whom the ATM address belongs.

00 = LEC
01 = LECS
02 = LES or BUS

For instance, if the switch's MAC address is 00:20:D4:14:41:80, then the 20-byte ATM address of the LECS is:

39:00:00:00:00:00:00:00:00:00:14:41:80:**00:20:D4:14:41:80:01**

Where
39:00:00:00:00:00:00:00:00:00:14:41:80 = netprefix
00:20:D4:14:41:80 = the switch's MAC address
01 = the Selector Byte indicating that this is the LECS

Additionally, within both the LES and BUS addresses, the byte that corresponds to the last byte of the MAC address is summed with the ELAN number. For example, the ATM address of the LESs on ELAN000, ELAN001, and ELAN010 are

LES for ELAN0**00** = 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:**80**:02

LES for ELAN0**01** = 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:**81**:02

LES for ELAN0**10** = 39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:D4:14:41:**8A**:02

3.2.2 ELANs Across Multiple Switches

ELANs can exist within a single switch, or they can span multiple switches. When an ELAN spans multiple switches, it's important that all switches within the group use the same LECS. The general rule is: "Within an administrative domain (a group of switches with related ELANs), there should be one and only one LECS." For this reason, never start the LECS on more than one switch within the administrative domain.

Note If an uplink or end node does not support PNNI, or if its version of ILMI is incompatible, it may be necessary to set up a static route between the device and the rest of the ELAN. See Section 4.2, "ATM Routing."

3.2.3 Switch Clients

It is important to understand the concept of SmartCell 6A000 switch client connections. A client connection is actually a connection between the VLAN and the SmartCell 6A000 CPU; this CPU connection appears as if the switch is an end station on the VLAN. The SmartCell 6A000 uses local clients to connect itself to the VLANs that it supports.

This is analogous to a phone company that supports a communication system. Even though the phone company maintains the circuits, a call to the phone company itself cannot be made unless the phone company has its own number and connection on its own phone system. Similarly, VLAN membership (and the reachability) of a SmartCell 6A000 on any particular VLAN depends upon whether the SmartCell 6A000 has a local client connection for that VLAN.

Clients are created using the command **`add laneclient`** for LAN emulation, and **`add ipatmclient`** for IP over ATM.

For example, the following command adds a switch client to the ELAN elan1:

```
SmartCell ZX# add laneclient
ClientNumber(0)                         : 1
LanName(ELAN001)                        : elan1
ServerType(LECS)                        :
ServerAddress()                         :
IPAddress()                             : 128.213.77.95
NetMask(255.255.0.0)                    :
MTU(1516)                               :
SmartCell ZX#
```

Prior to creating this local client connection, end devices could communicate with each other through **`elan1`**, but they could not communicate with the SmartCell 6A000.

4 SWITCH ADMINISTRATION

This chapter contains software and hardware procedures that you might need to perform on your SmartCell 6A000 switch. These procedures include

- Backing up switch configuration
- Creating routes and connecting switches
- Using switch events and alarms
- Creating PVC connections
- Managing switch traffic
- Using low-level boot load switch commands
- Upgrading switch software
- Saving switch core dumps to a TFTP server

4.1 BACKING UP AND RESTORING SWITCH CONFIGURATION

Once your SmartCell 6A000 ATM switch is up and running or you have made extensive changes to the configuration, you should back up the switch configuration. If the flash RAM gets formatted or corrupted, you can restore the switch configuration from the backup file.

Note The **backup** command backs up only the configuration files. It does not back up an image of the operating software.

To perform a back up or restore, you must have TFTP server software running on an end station that's reachable by the SmartCell 6A000. The **backup** command copies the configuration files on the switch to a directory specified by the TFTP server software. Often, this directory is /tftpboot; however, it may be different with your TFTP server software. Backup file names can be anything. Both the target backup directory and its file must exist and have appropriate read and write permissions for the backup to complete successfully.

The **backup** command prompts you for the IP address of the TFTP server end station, the backup path, and the name of the file within which you are saving the configuration. For example, if the IP address of the TFTP server end station is 90.1.1.100, and you want to save the switch configuration in the file named config-1 under the directory /back_dir, enter the following:

```
SmartCell ZX# backup switch
ServerIP() : 90.1.1.100
Path() : /back_dir/config-1
SmartCell ZX #
```

The switch stores the IP address of the TFTP server, the path, and the backup file name. The next time you enter the **backup** or **restore** commands, these values are presented as the default IP address and path. For example, when you enter the **restore** command, the following display appears:

```
SmartCell ZX# restore switch
ServerIP(90.1.1.100) :
Path(/back_dir/config-1) :
SmartCell ZX #
Backup file is valid.
Restoring a backup file will completely replace any data stored in the flash.
Are you sure this is what you want to do?
Confirm(y/n)?: y
SmartCell ZX #
```

Note You must reboot the switch for the **restore** to take effect.

4.2 ATM ROUTING

The SmartCell 6A000 default routing protocol is PNNI version 1.0. PNNI provides automatic and dynamic connectivity among all PNNI nodes within the same peer group. For purposes of interoperability, however, the SmartCell 6A000 also supports these additional ATM routing protocols:

- IISP — Use to connect with devices that do not support PNNI
- UNI — Use to connect end stations (also to connect devices whose implementation of ILMI is incompatible with the SmartCell 6A000)

Note Both IISP and UNI routes are created and modified using the **ATMRoute** command. The proper route type is determined by the SmartCell 6A000 through interface signaling information.

4.2.1 Creating an IISP Route

Use the **add ATMRoute** command to create an IISP route that links the SmartCell 6A000 to a device that supports only IISP routing. For example,

1. Physically connect port **b2** of the SmartCell 6A000 to the IISP device.
2. Enter **show NetPrefix** to determine the net prefix of port **b2** on the SmartCell 6A000:

```
SmartCell ZX # show netprefix b2
Port      NetPrefix
================================================================================
B2        39:00:00:00:00:00:00:00:00:00:14:41:80
SmartCell ZX #
```

3. Determine the address of the IISP device. (For this example, this could be a port address, we use 52:00:00:00:00:00:00:00:00:00:00:14:51:80)

4. Enter the **add ATMRoute** command to create a static route to the IISP device:

```
SmartCell ZX # add atmroute
PortNumber(A1) : b2
AtmAddress() : 52:00:00:00:00:00:00:00:00:00:14:51:80
PrefixLength(104) :
Index(0) :
Type(Internal) :exterior
Scope(0) :
MetricsTag(0) :
SmartCell ZX #
```

Note The **add ATMRoute** command allows you to specify a set of metrics to be used with the route. For more on metrics and metric tags, see Section 4.2.3 “Route Metrics.”

5. Enter the **show ATMRoute** command to determine whether the route was created:

```
SmartCell ZX # show atmroute
AddressNumber(ALL)                        :
No. Port Route Address                                                    Type Protocol
================================================================================
1    B4  39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:d4:14:41:80   I   MGMT
2    B4  39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:d4:14:41:81   I   MGMT
3    --  39:00:00:00:00:00:00:00:00:00:14:59:00                     I   PNNI
4    --  39:00:00:00:00:00:00:00:00:00:28:e9:80                     I   PNNI
5    --  39:00:00:00:00:00:00:00:00:00:28:f5:00                     I   PNNI
6    B4  47:00:79:00:00:00:00:00:00:00:00:00:00:a0:3e:00:00:01   I   MGMT
7    B2  52:00:00:00:00:00:00:00:00:00:14:51:80                     I   MGMT
SmartCell ZX #
```

The route to the IISP device appears on the last line (Route No. 7).

6. Create a route on the IISP device that refers to the net prefix (`39:00:00:00:00:00:00:00:00:00:14:41:80`) of port **b2** on the SmartCell 6A000.

Note For IISP routes to work with certain devices, ILMI may also need to be disabled on the SmartCell 6A000. Use the **set PortConfig** command to disable ILMI on the SmartCell 6A000 on a per-port basis.

IISP Routing Considerations

When creating routes between the SmartCell 6A000 (running PNNI) and IISP devices, the criteria that characterize IISP connectivity still apply. To reach a SmartCell 6A000 within the PNNI domain, the IISP device must have a configured route that points directly to a port on the target SmartCell 6A000. Conversely, there must be a SmartCell 6A000 that has a direct physical link (and a route over that link) to the IISP device. The following two examples illustrate this point.

In Figure 4-1 Switch A is an IISP device connected to the PNNI domain through Switch B. Switch A contains an LEC, which is a member of an ELAN whose LECS is on Switch C (within the PNNI domain). If the LEC on Switch A is to make contact with the LECS on Switch C, Switch A must contain an IISP route (denoted by the dotted line) directly to switch C. Furthermore, Switch B must contain a route to switch A over the physical link that connects the two switches.

Note Dotted lines in the diagrams below represent one-way routes to the devices pointed to by the arrowheads. Each route is defined on the device from which the dotted line originates.

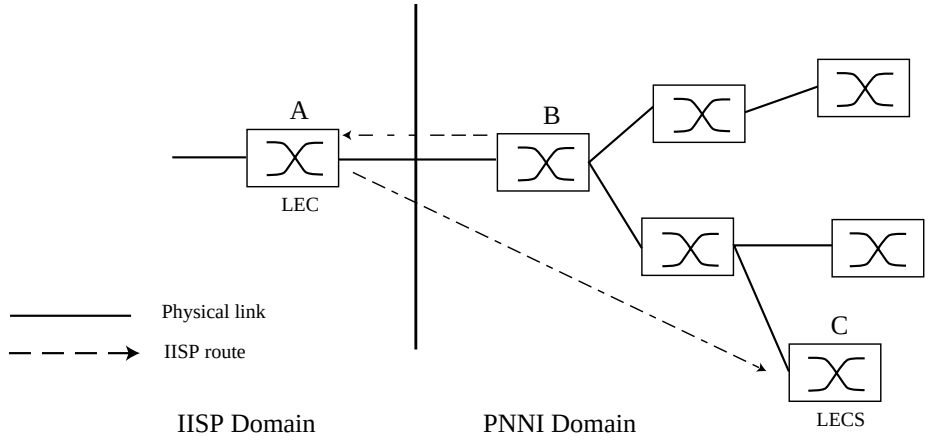

Figure 4-1 IISP route across PNNI domain

A second IISP device (Switch D) is added behind Switch A. If Switch D also needs to reach Switch C for LECS support, you must define additional IISP routes between Switches D and C, B and D, and A and D. Figure 4-2 shows the typical “route to every point reached” IISP topology.

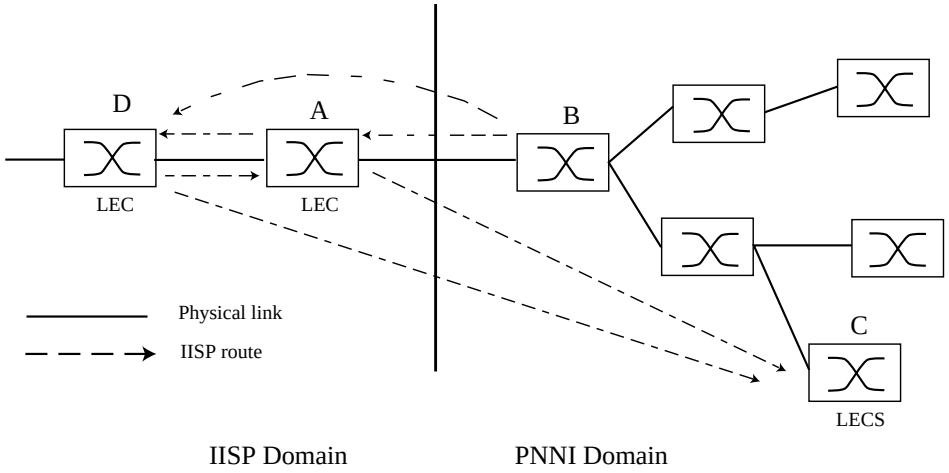

Figure 4-2 Routes needed for a second IISP switch

4.2.2 UNI Routes

Use the **add ATMRoute** command to create UNI routes. For example, connect an end station adapter (with MAC address 00:11:22:33:44:55) to port A2 of the SmartCell 6A000. If the adapter does not support ILMI or its ILMI is incompatible with the SmartCell 6A000, you must create a static UNI route between the adapter and port A2 of the SmartCell 6A000.

1. Enter the **show netprefix** command to obtain the netprefix of port A2

```
SmartCell ZX # show netprefix
PortNumber(ALL)                          : a2
 Port#   NetPrefix
================================================================================
A2       39:00:00:00:00:00:00:00:00:00:14:59:00
SmartCell ZX #
```

2. Reconfigure the adapter with an ATM address made from the netprefix of port A2 and the adapter's MAC address: 39:00:00:00:00:00:00:00:00:00:14:59:00:00:11:22:33:44:55:00.

3. Use the **add ATMRoute** command to create a static UNI route that specifies port A2 and the adapter's new ATM address.

```
SmartCell ZX # add atmroute
PortNumber(A1)                           : a2
AtmAddress()                           : 39:00:00:00:00:00:00:00:00:00:14:59:00:00:11:22:33:44:55:00
PrefixLength(152)                        :
Index(0)                                 :
Type(Internal)                           :
Scope(0)                                 :
MetricsTag(0)                            :
SmartCell ZX #
```

4. Enter the **show ATMRoute** command to check that the UNI route was added.

```
SmartCell ZX # show atmroute
AddressNumber(ALL)                       :
No. Port Route Address                                              Type Protocol
================================================================================
1    B4  39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:d4:14:41:80   I   MGMT
2    B4  39:00:00:00:00:00:00:00:00:00:14:41:80:00:20:d4:14:41:81   I   MGMT
3    --  39:00:00:00:00:00:00:00:00:00:14:59:00                     I   PNNI
4    A2  39:00:00:00:00:00:00:00:00:00:14:59:00:00:11:22:33:44:55   I   MGMT
5    --  39:00:00:00:00:00:00:00:00:00:28:e9:80                     I   PNNI
6    --  39:00:00:00:00:00:00:00:00:00:28:f5:00                     I   PNNI
7    B4  47:00:79:00:00:00:00:00:00:00:00:00:00:a0:3e:00:00:01   I   MGMT
8    B2  52:00:00:00:00:00:00:00:00:00:14:51:80                     I   MGMT
SmartCell ZX #SmartCell ZX #
```

The UNI route appears in the table as route number four (No. 4).

Note For UNI routes to work with certain devices, ILMI may also need to be disabled on the SmartCell 6A000. Use the **set PortConfig** command to disable ILMI on the SmartCell 6A000 on a per-port basis.

4.2.3 Route Metrics

Route metrics are assigned to routes using a metric tag (one of the input parameters for **`add ATMRoute`**). The metric tag specifies a particular pair of incoming and outgoing metrics contained within a list of metrics. Metrics are created using the **`add PNNIMetric`** command. Each metric pair specifies a set of values that describe a route's Service Category, cell rates, bandwidth, and administrative weight. Locally, metric values determine the behavior of the link, while network-wide, PNNI's Generic Call Admission Control (GCAC) assesses metrics when establishing calls.

In the following example, a metric pair is created (with metric tag of nine) that specifies CBR as the Service Category, administrative weight of 200, Max Cell Rate of 1000 cells per second, and an Available Cell Rate of 750 cells per second.

First, we create the outgoing member of the metric pair:

```
SmartCell ZX # add pnnimetrics
MetricsTag(1)                          : 9
TrafficDirection(Outgoing)             :      < 1st pair member, we accept the default
ServiceCategory(UBR)                   : cbr
GCAC_CLP(2)                            :
AdminWeight(5040)                      : 200
MaxCellRate(-1)                        : 1000
AvailableCellRate(-1)                  : 750
MaximumCellTransferDelay(-1)           :
CellDelayVariation(-1)                 :
CellLossRatioForCLP=0(-1)              :
CellLossRatioForCLP=0+1(-1)            :
CellRateMargin(-1)                     :
VarianceFactor(-1)                     :
```

Next, we create the incoming member of the metric pair:

```
SmartCell ZX # add pnnimetrics
MetricsTag(1)                          : 9
TrafficDirection(Outgoing)             : incoming   < 2nd pair member, we set as incoming
ServiceCategory(UBR)                   : cbr
GCAC_CLP(2)                            :
AdminWeight(5040)                      : 200
MaxCellRate(-1)                        : 1000
AvailableCellRate(-1)                  : 750
MaximumCellTransferDelay(-1)           :
CellDelayVariation(-1)                 :
CellLossRatioForCLP=0(-1)              :
CellLossRatioForCLP=0+1(-1)            :
CellRateMargin(-1)                     :
VarianceFactor(-1)                     :
SmartCell ZX #
```

Enter **show PNNIMetric** to view the newly created metric pair:

```
SmartCell ZX # show pnnimetrics
Metrics(ALL)                              :

Metrics Metrics Tag  Direction Index      GCAC CLP  Admin Wt Service Categories
================================================================================
1       0x9          Incoming  0x10       CLP0+1        200   CBR
2       0x9          Outgoing  0x10       CLP0+1        200   CBR
3       0x111113     Outgoing  0x1        CLP0+1       5040   UBR
4       0x111113     Outgoing  0x2        CLP0+1       5040   ABR
5       0x111113     Outgoing  0x4        CLP0         5040   NRTVBR
6       0x111113     Outgoing  0x18       CLP0         5040   CBR RTVBR
7       0x111114     Outgoing  0x1        CLP0+1       5040   UBR
8       0x111114     Outgoing  0x2        CLP0+1       5040   ABR
9       0x111114     Outgoing  0x4        CLP0         5040   NRTVBR
10      0x111114     Outgoing  0x18       CLP0         5040   CBR RTVBR

SmartCell ZX #
```

The newly created metric pair appears at the top of the list.

Once the metric is created, we can specify its metric tag number within the definition of a route:

```
SmartCell ZX # add atmroute
PortNumber(A1)                            : b2
AtmAddress()                              : 39:00:00:00:00:00:00:00:00:00:55:77:88
PrefixLength(104)                         :
Index(0)                                  :
Type(Internal)                            :
Scope(0)                                  :
MetricsTag(0)                             : 9    < The index tag of our metric pair
SmartCell ZX #
```

Administrative Weight and Parallel Routes

A route's administrative weight defines its desirability to the PNNI routing service with regard to computing a path to a particular location. The lower the administrative weight, the more desirable the route. For example, a route with administrative weight 200 is considered a better route than one with the default weight of 5040. As a result, the administrative weight provides a quantitative way to control which routes are favored for call set up.

The ability to control the PNNI routing service in this fashion allows for parallel routes into an IISP domain to be weighted such that one route is designated as the default, while the other becomes the backup route. This default/backup routing topology is typically used where a link to a particular domain requires a high degree of reliability. If the default route becomes congested or reaches its bandwidth limit, the routing service can initiate load sharing by routing additional calls through the backup route.

4.3 IP ROUTING

The SmartCell 6A000 switch provides limited IP routing. IP routing allows switches that are not connected directly to Ethernet to communicate with an Ethernet-based network management system (NMS). The connection is made by adding IP routes on the non-connected switches that specify a client on a connected switch as their gateway to the Ethernet.

Note SmartCell 6A000 IP routing performance is inadequate for routing between VLANs. If you need to create routes between VLANs on your SmartCell 6A000, use a router equipped with an ATM interface. Consult Cabletron Customer Support for recommended routers.

For example,

- Switch SW1 and the NMS are on an Ethernet network with address 128.205.99.0.
- The IP address of SW1's Ethernet port is 128.205.99.254.
- The IP address of SW1's LANE client is 90.1.1.254.
- The IP address of SW2's LANE client is 90.1.1.33.
- SW2 is not physically connected to the Ethernet network.
- SW2 is connected to SW1 through PNNI, and are both part of the same emulated LAN.

To reach SW2 with the Ethernet-based NMS, create an IP route that assigns SW1's switch client as SW2's default gateway to the network 128.205.99.0. Enter the following on SW2 (see Figure 4-3):

```
SmartCell ZX # add route
DestNetIP() : 128.205.99.0   < address of the Ethernet network to reach
GatewayIP() : 90.1.1.254     < IP address of SW1's LANE client
SmartCell ZX #
```

Switch SW2 can communicate with the NMS on the Ethernet network.

To see the route, enter the **show route** command on SW2

```
SmartCell ZX # show route
ROUTE NET TABLE
destination      gateway          flags  Refcnt  Use           Interface
-------------------------------------------------------------------------
0.0.0.0          0.0.0.0          1      0       0             zn0
90.1.1.0         90.1.1.33        1      0       1688          zn1
128.205.99.0     90.1.1.254       1      3       5660          ei0
-------------------------------------------------------------------------
ROUTE HOST TABLE
destination      gateway          flags  Refcnt  Use           Interface
-------------------------------------------------------------------------
127.0.0.1        127.0.0.1        5      0       0             lo0
-------------------------------------------------------------------------
SmartCell ZX #
```

Note The NMS must contain a route that specifies the Ethernet interface of the Ethernet connected switch as the gateway to the ELAN subnet.

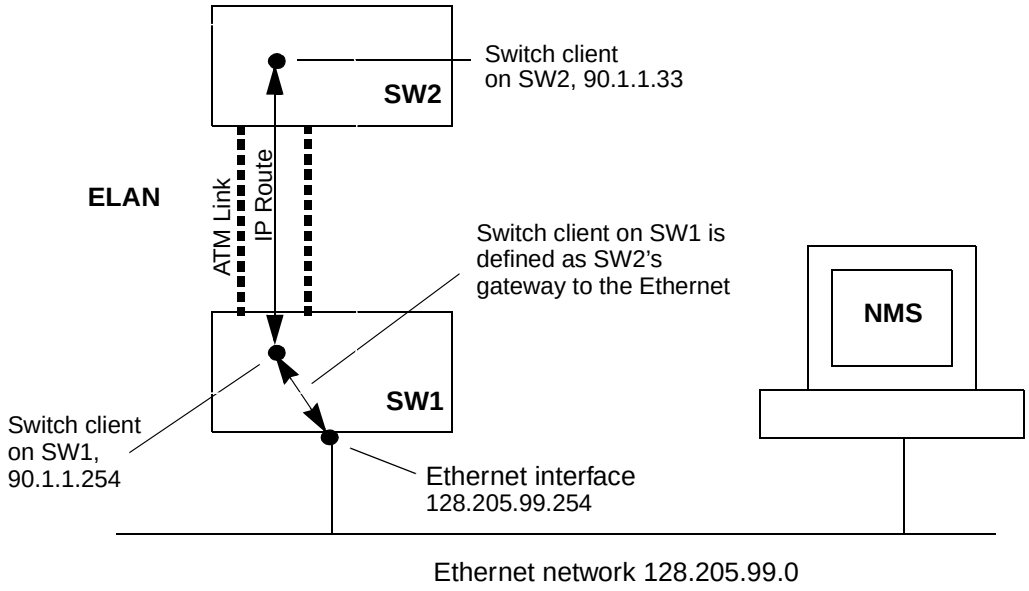

Figure 4-3 IP routing through SW1 for connectivity to the Ethernet network

4.4 EVENTS AND ALARMS

The SmartCell 6A000 switch records and reports its operation in real-time through the use of events and alarms. An event is an occurrence of a significant activity. For instance, a port going down or a client joining an ELAN are examples of events. Alarms are a specific class of events defined as "events that the user needs to know about or attend to immediately." Alarms do not always indicate switch faults. Alarms may also be informational events. For instance, "LECS Operational" is an example of an alarm that is not a switch fault, but is an activity that the user should know about immediately.

4.4.1 Event Categories

Events are grouped into the following categories:

- Critical — Impacts the entire switch, leaving the system unavailable or in a degraded state
- Major — Impacts a feature of the switch, leaving the feature unavailable or in a degraded state
- Minor — Impacts the system or feature, leaving it in a sub-optimal state
- Informational — An occurrence of an activity that the user should know about

Both events and alarms are stored within circular memory buffers. When the buffers become full, older events and alarms are overwritten by newer entries. Both events and alarms are stored in shared RAM. However, the 40 most recent alarms are also stored in flash RAM. Storing these 40 alarms in flash RAM makes them persistent between reboots of the SmartCell 6A000, and provides information about the state of the switch prior to reboot.

4.4.2 Viewing Events and Alarms

Use the **show events** command to view a list of the currently logged events. For example,

```
SmartCell ZX # show events
Index(ALL)                                  :
0  MINOR EVENT        000:00:08:410
-------------------------------------------------
SAAL connection has become active, initiated by the peer
Port ID 0x0000000b
Protocol 0x02

1  MINOR EVENT        000:00:08:578
-------------------------------------------------
SAAL connection has become active, initiated by the peer
Port ID 0x0000000b
Protocol 0x02

2  MINOR EVENT        000:00:29:560
-------------------------------------------------
Sendto failed for IP address 206.61.231.153

More(<space>/q)?:
```

Events are displayed in the following format:

- Event number — The index number of the event in the circular buffer
- Event ID — A unique ID assigned to the event
- Time — Time of event, in switch up-time in hours, minutes, seconds, and milliseconds
- Category — Whether this event is critical, major, minor, or informational
- Object — The object affected by the event (port, LEC, and so on)
- Description — Brief message describing the event

Event messages can be automatically displayed on the SmartCell 6A000 console. Use the **set EventDisplay** command to display events on the console as they occur:

```
SmartCell ZX # set eventdisplay
EventDisplay(OFF)                           : on
SmartCell ZX #
```

Note Depending on the activity of your SmartCell 6A000, the appearance of events on the SmartCell 6A000 may be too frequent to use the SmartCell 6A000 console comfortably. It is recommended that you turn on the automatic display of events only when troubleshooting.

Use the **show alarms** command to view a list of the currently logged alarms. For example,

```
SmartCell ZX # show alarms
Index(ALL)                              :
0  000:00:31:164
-------------------------------------------------
LECS Operational
-------------------------------------------------
Failed to re-establish SAAL connection
Port ID 0x0000000b
T309    10000

1  043:15:56:718
-------------------------------------------------
Failed to re-establish SAAL connection
Port ID 0x0000000b
T309    10000

2  043:29:55:392
More(<space>/q)?:
```

Alarms are displayed in the following format:

- Alarm number — The index number of the alarm in the circular buffer
- Alarm ID — A unique ID assigned to the alarm
- Time — Time of alarm, in switch up-time in hours, minutes, seconds, and milliseconds
- Object — The object affected by the alarm (port, LEC, and so on)
- Description — Brief message describing the alarm

Alarm messages can be automatically displayed on the SmartCell 6A000 console. Use the **set AlarmDisplay** command to display alarms on the console as they occur:

```
SmartCell ZX # set alarmdisplay
alarmDisplay(OFF)                       : on
SmartCell ZX #
```

4.4.3 Deleting Events and Alarms

To delete events or alarms currently logged within your SmartCell 6A000, use the **delete events** and **delete alarms** commands, respectively.

4.5 PVC CONNECTIONS

The SmartCell 6A000 supports Permanent Virtual Circuits (PVCs), both point-to-point and point-to-multipoint. Use PVCs to connect devices (that do not support SVCs) to a switch's local client. Also, use PVCs to make connections through the SmartCell 6A000 between devices that support only PVCs.

Use point-to-point PVCs to connect one end node to another for two-way communication. Use point-to-multipoint PVCs to connect a broadcast end node to a group of receiving end nodes; traffic is one way.

Note PVCs use traffic descriptors to define their traffic characteristics. If you are unfamiliar with traffic descriptors, see Section 4.6.1, "Traffic Descriptors."

4.5.1 Point-to-Point PVCs

The procedure for setting up a PVC connection between two end nodes through the SmartCell 6A000 consists of specifying the ports and the virtual path and virtual channel identifiers (VPI and VCI).

1. Use **`add trafficdescriptor`** to define a traffic descriptor to use with the PVC

```
SmartCell ZX # add trafficdescriptor
TrafficType(UBR)                          : cbr
TrafficDescriptorType(2)                  :
PCRCLP01(100)                             :
PCRCLP0(0)                                :
SCRCLP01(0)                               :
SCRCLP0(0)                                :
MBSCLP01(0)                               :
MBSCLP0(0)                                :
QOSCLASS(1)                               :
AalType(5)                                :
SmartCell ZX #
```

For this example, we specify CBR as the traffic type, then take the remaining defaults. Enter the **`show trafficdescriptor`** command to obtain the index number of the new traffic descriptor. In this example, the index number is two (2).

```
SmartCell ZX # show trafficdescriptor
================================================================================
TD#  Traff    Desc  QoS  Peak Cell Rate  Sust Cell Rate  Max Burst Size  Aal
     Type     Type         (Kb/s)           (Kb/s)          (Kb/s)      Type
                        CLP_0  CLP_0+1  CLP_0  CLP_0+1  CLP_0  CLP_0+1
================================================================================
2    CBR      2     1    0      100      0      0        0      0        5
176  NRTVBR   2     1    0      1585     0      0        0      0        5
SmartCell ZX #
```

2. Use **`add pvc`** to create the PVC; specify the ports through which the connection is established, the VPI/VCI pair to use with each port, and the traffic descriptor to use.

```
SmartCell ZX # add pvc
ConnType(PTP)                             :
LowPortID()                               : c1    <we specify port c1
LowVPI()                                  : 0     <we specify VPI = 0
LowVCI()                                  : 100   <we use VCI = 100
HighPortID()                              : b2    <we specify port b2
HighVPI()                                 : 0
HighVCI()                                 : 100
FwdTrafficDescriptorIndex()               : 2     <we use our created traffic descriptor
BkwTrafficDescriptorIndex()               : 2     <we use our created traffic descriptor
SmartCell ZX #
```

The example above creates a PVC between ports C1 and B2 with VPI/VCI = 0/100.

3. Plug the end nodes into the specified SmartCell 6A000 ports (C1 and B2).

4. Configure each end node with the proper IP address, subnet mask, and VPI/VCI pair = 0/100.

The end nodes can communicate with each other through the point-to-point PVC connection.

4.5.2 Point-to-Multipoint PVCs

Instructions in this section describe how to set up a point-to-multipoint connection through your SmartCell 6A000.

Example: Create a point-to-multipoint connection between a broadcasting workstation on port A1 and three other workstations connected to ports B2, B3, and C1.

1. Use **add trafficdescriptor** to create two new traffic descriptors, one for the forward direction, the other for the backward direction. For this example, for the forward traffic descriptor, we select UBR and accept the defaults.

```
SmartCell ZX # add trafficdescriptor          <this is the forward descriptor
TrafficType(UBR)                          :   <we use UBR for this example
TrafficDescriptorType(11)                 :
PCRCLP01(100)                             :   <we take the default values
PCRCLP0(0)                                :
SCRCLP01(0)                               :
SCRCLP0(0)                                :
MBSCLP01(0)                               :
MBSCLP0(0)                                :
QOSCLASS(0)                               :
AalType(5)                                :
md1 #
```

However, on a point-to-multipoint connection there should be no traffic in the backward direction, so we define the backward traffic descriptor with its Cell Loss Priorities set to zero (0)

```
md1 #add trafficdescriptor                    <this is the backward descriptor
TrafficType(UBR)                          :
TrafficDescriptorType(11)                 :
PCRCLP01(100)                             :0  <we set everything to zero
PCRCLP0(0)                                :
SCRCLP01(0)                               :
SCRCLP0(0)                                :
MBSCLP01(0)                               :
MBSCLP0(0)                                :
QOSCLASS(0)                               :
AalType(5)                                :
SmartCell ZX #
```

2. Use **show trafficdescriptor** to obtain the new traffic descriptors' index numbers.

```
SmartCell ZX # show trafficdescriptor
================================================================================
TD#  Traff    Desc  QoS  Peak Cell Rate  Sust Cell Rate  Max Burst Size  Aal
     Type     Type         (Kb/s)           (Kb/s)          (Kb/s)      Type
                         CLP_0  CLP_0+1  CLP_0  CLP_0+1  CLP_0  CLP_0+1
================================================================================
2    CBR      2     1    0      100      0      0        0      0        5
6    UBR      11    0    0      100      0      0        0      0        5
7    UBR      11    0    0      0        0      0        0      0        5
176  NRTVBR   2     1    0      1585     0      0        0      0        5
SmartCell ZX #
```

In the example above, traffic descriptor six (6) will be used in the forward direction, and traffic descriptor seven (7) will be used in the backward direction.

3. Use **add pvc** to successively create point-to-multipoint PVCs for ports B2, B3, and C1.

```
SmartCell ZX # add pvc
ConnType(PTP)                             : pmp
LowPortID()                               : a1
LowVPI()                                  : 0
LowVCI()                                  : 101
HighPortID()                              : b2
HighVPI()                                 : 0
HighVCI()                                 : 101
FwdTrafficDescriptorIndex()               : 6
BkwTrafficDescriptorIndex()               : 7
SmartCell ZX #
```

4. Perform step 3 for ports B3 and C1.

5. Connect the workstations to their respective ports.

6. Configure the workstations for the same subnet and VPI/VCI pair = 0/101.

The broadcasting workstation on port A1 can send traffic to the receiving workstations on ports B2, B3, and C1.

4.5.3 Connecting to Local Switch Client Through a PVC

All PVC connections to the SmartCell 6A000 local clients use B4 (the CPU port) as the HighPort.

Follow these instructions to connect an end node to a SmartCell 6A000 local client through a point-to-point PVC.

1. Use **add pvc** to create the PVC.

```
SmartCell ZX # add pvc
ConnType(PTP)                          :       <we use a point-to-point PVC
LowPortID()                            : a1    <for this example, we connect through port a1
LowVPI()                               : 0
LowVCI()                               : 100
HighPortID()                           : b4    <HighPort must be b4
HighVPI()                              : 0
HighVCI()                              : 100
FwdTrafficDescriptorIndex()            : 2
BkwTrafficDescriptorIndex()            : 2
SmartCell ZX #
```

2. Use **add ipatmclient** to create the IP over ATM local client.

```
SmartCell ZX # add ipatmclient
ClientNumber(0)                        : 2       <we use client # 2 in this example
ServerType(NONE)                       : local   <ARP server on the switch
ServerAddress()                        :
IPAddress()                            : 10.1.1.0
NetMask(255.0.0.0)                     :
MTU(9180)                              :
SmartCell ZX #
```

3. Use **add ipatmpvc** to associate the end node's IP address with the PVC.

```
SmartCell ZX # add ipatmpvc
ClientNumber(0)                        : 2       <specify local client number
DestinationIP()                        : 10.1.1.22   <end node's IP address
DestinationVPI(0)                      :
DestinationVCI(33)                     : 100     <VCI was specified as 100
SmartCell ZX #
```

4. Connect the end node to port A1 of the SmartCell 6A000.

5. Configure the end node with IP address 10.1.1.22, subnet mask 255.0.0.0, and VPI/VCI pair = 0/100.

4.5.4 Non-zero VPIs

The SmartCell 6A000 uses 12 bits to define VPI/VCI pairs. The **vccmask** determines how many of the 12 bits are used for the VPI and how many are used for the VCI. The **vccmask** uses a 2-bit register to hold four different VPI/VCI 12-bit combinations. Table 4-1 shows the registers and the values that come preconfigured on the SmartCell 6A000.

Table 4-1 Values for VPI and VCI

VCC Mask Index	VPI Bits	VPI Values	VCI Bits	VCI Values
0	0	0	12	0 to 4096
1	2	0 to 3	10	0 to 1023
2	4	0 to 15	8	0 to 255
3	6	0 to 63	6	0 to 63

Use the **show vccmask** command to view the four preconfigured VPI/VCI combinations.

```
SmartCell ZX # show vccmask
MaskIndex   VpiShift     VciShift
           (In bits)     (In bits)
=============================================================================
  0          0            12
  1          2            10
  2          4            8
  3          6            6
SmartCell ZX #
```

VCCMask combinations dictate what numerical values can be used for VPI/VCI pairs. Any VPI and VCI pairs that fit the bit distribution of one of the indexed combinations can be used for defining a PVC. If the VPI and VCI values do not fit one of the indexed combinations, the SmartCell 6A000 uses the closest matching indexed combination.

If you need to use values for VPI and VCI that do not fall within the range of one of the preconfigured indexed combinations, use the **set vccmask** command to replace one of the preconfigured combinations.

For example, change VCCMask indexed combination zero (0) from VPI = 0 bits and VCI = 12 bits to VPI = 3 bits and VCI = 9 bits.

1. Use **set vccmask** to change the VPI/VCI values to 3/9.

```
SmartCell ZX # set vccmask
MaskIndex(0)                              : <we replace the first VPI/VCI pair
VPIShift(0)                               : 3
VCIShift(12)                              : 9
SmartCell ZX #
```

2. Use the **show vccmask** command to see the new VPI/VCI combination.

```
SmartCell ZX # show vccmask
MaskIndex   VpiShift     VciShift
           (In bits)     (In bits)
=============================================================================
  0          3            9     <for index 0, VPI/VCI now equals 3/9
  1          2            10
  2          4            8
  3          6            6
SmartCell ZX #
```

3. Use the **`set portconfig`** command to reconfigure a port to use the new values for VPI and VCI. For example, to set up a PVC on port A1 using the new VPI/VCI bit ranges (3/9), enter

```
SmartCell ZX # set portconfig a1
PortAdminStatus(up)                      :
IlmiAdminStatus(enable)                  :
IlmiAddressRegistration(enable)          :
IlmiConnectivity(enable)                 :
SigType(autoConfig)                      :
SigRole(other)                           :
InterfaceType(private)                   :
MaxVpiBits(0)                            : 3
MaxVciBits(12)                           : 9
MaxSvcVpi(7)                             :
MinSvcVci(32)                            :
MaxVccs(4096)                            :
SmartCell ZX #
```

4. Use **`show portconfig`** to see the change to port A1.

```
SmartCell ZX # show portconfig a1
================================================
 Port: A1
 ------------------------------------------------
 Parameter              Configured     Current
 ------------------------------------------------
 Sig Type                autoConfig     pnni10
 Sig Role                other          symmetric
 Interface Type          private        private
 Max vpi bits            3              0       <VPI on port A1 can now be any 3-bit number
 Max vci bits            9              9       <VCI on port A1 can now be any 9-bit number
 Max SVC vpci            7              0
 Min SVC vci             32             32
 Max Vccs                4096           4096
 ------------------------------------------------
 Other parameters
 ------------------------------------------------
 Port Admin Status       UP
Ilmi Admin Status       Enabled AddressRegistration Connectivity
 Oper State              UP
 Trans Type              STS-3c
 Media Type              MMF (S)
 Bandwidth               155 MB
SmartCell ZX #
```

PVCs can be configured for port A1 using VPI values from 0 to 7 and VCI values from 0 to 511.

Note Do not set the VCI part of the VCCMask to fewer than 5 bits.

Note Do not change the VCCMask for the CPU port (B4).

4.6 TRAFFIC MANAGEMENT

This section describes how the SmartCell 6A000 manages bandwidth and congestion. It briefly describes console commands that affect how the SmartCell 6A000 manages traffic. This section also provides guidelines for setting some traffic control parameters.

Note For information on troubleshooting traffic congestion problems, see Chapter 5, "Troubleshooting."

The SmartCell 6A000 has extensive abilities for managing the flow of traffic. Traffic management includes all operations performed by the SmartCell 6A000 that ensure optimum switch throughput, where throughput is based on rate of packet loss, available bandwidth, and traffic processing overhead. Under most conditions, the SmartCell 6A000 can efficiently and automatically manage switch traffic. However, if necessary, you can adjust the switch traffic management parameters. For example, it might be necessary to adjust parameters for a port that carries a large amount of CBR traffic or a very large number of simultaneous connections.

The SmartCell 6A000 provides console commands that affect traffic flow on a global, port, or category of service level. These console commands affect switch traffic flow by controlling

- Bandwidth allocation
- Call Admission Control (CAC) policies
- The service category for a connection
- Buffer memory allocation
- Threshold settings for anti-congestion routines

Caution Do not change traffic control settings unless you have expert-level experience with ATM switching. Back up the switch configuration before making changes. Also, make notes of the changes you make to the traffic control parameters.

4.6.1 Traffic Descriptors

Traffic characteristics of an ATM source are signaled through a set of traffic descriptors during connection establishment. The SmartCell 6A000 uses traffic descriptors for resource allocation during call set up and guarantees the Quality of Service (QoS) across the connection. The source traffic descriptor is a set of parameters that describes the expected bandwidth utilization of a connection. You can set these parameters,

- Peak Cell Rate (PCR)
- Sustainable Cell Rate (SCR) and Maximum Burst Size (MBS)
- Minimum Cell Rate (MCR) and Initial Cell Rate (ICR) — signaled through UNI4.0 signaling only

Traffic descriptors vary for each QoS. If a connection is bi-directional, a traffic descriptor has to be assigned to each direction and need not be the same in both directions.

SmartCell 6A000 user data cells are classified according to the state of a cell loss priority (CLP) bit in the header of each cell. A CLP 1 cell has a lower priority than a CLP 0 cell and is discarded first. Source traffic descriptors can specify CLP 0 cell traffic, CLP 1 cell traffic, or the aggregate CLP 0+1 traffic.

Use the **trafficdescriptor** commands to view, create, and delete traffic descriptors.

For example, enter the **show trafficdescriptor** command to view all currently defined traffic descriptors.

```
SmartCell ZX# show trafficdescriptor
================================================================================
TD#  Traff    Desc  QoS  Peak Cell Rate  Sust Cell Rate  Max Burst Size  Aal
     Type     Type        (Kb/s)          (Kb/s)          (Kb/s)      Type
                        CLP_0  CLP_0+1  CLP_0  CLP_0+1  CLP_0  CLP_0+1
================================================================================
2    CBR      2     1    0      100      0      0        0      0        5
6    UBR      11    0    0      100      0      0        0      0        5
7    UBR      11    0    0      0        0      0        0      0        5
176  NRTVBR   2     1    0      1585     0      0        0      0        5
SmartCell ZX#
```

Note You cannot use the default traffic descriptors for user-defined PVCs. All traffic descriptors used to define PVCs must be created by the user.

The Descriptor Type parameter in the example above corresponds to the traffic descriptor types defined in the UNI3.0/UNI3.1 specification. Descriptor types are specified numerically and correspond to the descriptions in Table 4-2.

Table 4-2 Traffic descriptor type number explanation

Type Number	Descriptor Characteristics
1	No Traffic Descriptor
2	Traffic Descriptor with no CLP and no SCR
3	Traffic Descriptor with CLP, no Tagging, and no SCR
4	Traffic Descriptor with CLP, Tagging, and no SCR
5	Traffic Descriptor with no CLP and SCR
6	Traffic Descriptor with CLP, no Tagging, and SCR
7	Traffic Descriptor with CLP, Tagging, and SCR
11	Traffic Descriptor with CLP and best effort

A user-defined PVC must have user-defined traffic descriptors. For instance, if a video link over a PVC requires a constant data flow of 5000 kb/s and a peak cell rate of 8000 kb/s, create a traffic descriptor for CBR traffic that specifies 5000 as the sustained cell rate and 8000 as the peak cell rate.

```
SmartCell ZX # add trafficdescriptor
TrafficType(UBR)                          : cbr
TrafficDescriptorType(2)                  : 3
PCRCLP01(100)                             : 8000
PCRCLP0(100)                              :
SCRCLP01(0)                               : 5000
SCRCLP0(0)                                :
MBSCLP01(0)                               : 10000
MBSCLP0(0)                                :
QOSCLASS(1)                               :
AalType(5)                                :
SmartCell ZX #
```

Each traffic descriptor is identified by a unique index number. Use the index number to specify which traffic descriptor to use when setting up a PVC. For example, the **`add pvc`** command prompts you for the traffic descriptor index.

```
SmartCell ZX# add pvc
ConnType(PTP)                           :
LowPort( )                              : b1
LowVPI( )                               :0
LowVCI( )                               :100
HighPort( )                             : b2
HighVPI( )                              :0
HighVCI( )                              :100
FwdTrafficDescriptorIndex( )            : 3   < forward traffic descriptor index
BkwTrafficDescriptorIndex( )            : 2   < backward traffic descriptor index
SmartCell ZX#
```

Notice in the example above that you can use different traffic descriptors for forward and backward traffic.

4.6.2 Call Admission Control Policy

Call Admission Control (CAC) policy defines the bandwidth allocation scheme used by the CAC when setting up connections. The SmartCell 6A000 offers three schemes that can be set on a per-port, per-service class basis,

- Conservative
- Moderate
- Liberal

Under conservative policy, the CAC allocates bandwidth closest to the requested bandwidth and QoS parameters. Conversely, liberal policy causes the CAC to allocate the least amount of bandwidth. And the CAC under moderate policy allocates intermediate amounts of bandwidth.

Depending on the type of traffic on your network, each of these CAC policies has its advantages. For instance, liberal policy allows a larger number of connections over that of the conservative or moderate policy. Liberal policy assumes that the traffic pattern of individual VCs does not overlap most of the time. For example, if VC1 and VC2 are created under the liberal CAC policy, it's assumed that the probability of both VCs sending large bursts of cells at the same time is relatively low. On the other hand, conservative policy assumes that there might be a larger overlap of traffic from different VCs, and provides each VC with bandwidth closer to the requested bandwidth. This higher bandwidth provides a guarantee of quality for each VC.

Use the command **show CACEqBwAllocScheme** to view the current CAC policies used by each port for each QoS and referenced by VPI.

```
SmartCell ZX # show caceqbwallocscheme
PortID(ALL)                                 :
Vpi(0)                                      :
============================================================
Port#    VPI               Alloc Scheme
                                 for
                 CBR    RT-VBR  NRT-VBR UBR    ABR
============================================================
A1         0     CON     CON     CON     LIB    CON
A2         0     CON     CON     CON     LIB    CON
A3         0     CON     CON     CON     LIB    CON
A4         0     CON     CON     CON     LIB    CON
B1         0     CON     CON     CON     LIB    CON
B2         0     CON     CON     CON     LIB    CON
B3         0     CON     CON     CON     LIB    CON
B4(CPU)    0     CON     CON     CON     LIB    CON
C1         0     CON     CON     CON     LIB    CON
C2         0     CON     CON     CON     LIB    CON
C3         0     CON     CON     CON     LIB    CON
C4         0     CON     CON     CON     LIB    CON
D1         0     CON     CON     CON     LIB    CON
D2         0     CON     CON     CON     LIB    CON
D3         0     CON     CON     CON     LIB    CON
D4         0     CON     CON     CON     LIB    CON
SmartCell ZX #
```

If there are a large number of connections of a particular QoS on a particular port, and these connections begin to slow down and show signs of congestion, use the **set CACEqBwAllocScheme** command to change the CAC policy to moderate or conservative.

```
SmartCell ZX # set caceqbwallocscheme
PortID(A1)                                  : b2
Vpi(0)                                      :
SeriveCategory(CBR)                         : ubr
AllocScheme(LIBERAL)                        :conservative
SmartCell ZX #
```

The SmartCell 6A000 performs buffering using a shared-memory architecture. Buffer space is divided into queues for each QoS. In turn, ports are allocated some portion of each of the QoS queues. This allocation is controlled on a per-port basis by the **porttrafficcongestion** commands.

Qos is defined on an end-to-end basis in terms of cell loss ratio, cell transfer delay, and cell delay variation.

For example, enter the **show porttrafficcongestion** command to view current buffer utilization.

```
SmartCell ZX # show porttrafficcongestion
PortNumber(ALL)                          :
Port ID      Queue 1      Queue 2      Queue 3      Queue 4
            Min   Max    Min   Max    Min   Max    Min   Max
=============================================================================
A1            20  1000     20  2000     20  1000     20 16384
A2            20  1000     20  2000     20  1000     20 16384
A3            20  1000     20  2000     20  1000     20 16384
A4            20  1000     20  2000     20  1000     20 16384
B1            20  1000     20  2000     20  1000     20 16384
B2            20  1000     20  2000     20  1000     20 16384
B3            20  1000     20  2000     20  1000     20 16384
B4(CPU)       20  1000     20  2000     20  1000     20 16384
C1            20  1000     20  2000     20  1000     20 16384
C2            20  1000     20  2000     20  1000     20 16384
C3            20  1000     20  2000     20  1000     20 16384
C4            20  1000     20  2000     20  1000     20 16384
D1            20  1000     20  2000     20  1000     20 16384
D2            20  1000     20  2000     20  1000     20 16384
D3            20  1000     20  2000     20  1000     20 16384
D4            20  1000     20  2000     20  1000     20 16384
SmartCell ZX #
```

Min and Max are thresholds set on a per-queue, per-port basis and are measured in cells (53 bytes). The Min threshold is the amount of buffer space guaranteed to a call of a particular QoS on the corresponding port. The Max threshold is the maximum amount of buffer space that a call of a particular QoS is allowed on the corresponding port.

QoS corresponds to the queues as follows:

- Queue 1 — Constant Bit Rate (CBR)
- Queue 2 — Real Time Variable Bit Rate (rt-VBR)
- Queue 3 — Non-real time Variable Bit Rate (Nrt-VBR)
- Queue 4 — Unspecified Bit Rate (UBR)

If calls of a particular QoS type are being dropped on a particular port, use the **set porttrafficcongestion** command to raise the port's queue Min threshold.

For example, to change both the Min and Max amounts of buffer space used for CBR calls on port **a3**, enter the following:

```
SmartCell ZX # set porttrafficcongestion
Port(ALL)                                : a3
Queue1MinimumCellCounter(20)             : 1000  < Min for CBR queue
Queue2MinimumCellCounter(20)             :
Queue3MinimumCellCounter(20)             :
Queue4MinimumCellCounter(20)             :
Queue1MaximumCellCounter(1000)           : 10000  < Max for CBR queue
Queue2MaximumCellCounter(2000)           :
Queue3MaximumCellCounter(1000)           :
Queue4MaximumCellCounter(16384)          :
SmartCell ZX #
```

Quality of Service Queue Allocation Guidelines

The following values are recommended settings for the Min and Max thresholds for the QoS queues under specific sustained traffic conditions. Use the settings in Table 4-3 as guidelines for threshold settings.

Table 4-3 Settings for QoS queues

QoS Queue	Recommended Settings
CBR	fewer than 100 connections on a port: Min = 50, Max = 1000
CBR	more than 100 connections on a port: Min = 100, Max = 1000
rt-VBR	bandwidth utilization less than 20%: Min = 10, Max = 1000*
rt-VBR	bandwidth utilization more than 20 %: Min = 100, Max = 4000*
Nrt-VBR	for port B4 (CPU): Min = 100, Max = 4000
Nrt-VBR	for all other ports: Min = 10, Max = 1000
UBR	Min = 32, Max = 16,000

* Use the **`show cacstats`** command to view bandwidth utilization.

4.6.3 EFCI, EPD, and RM Thresholds

To control switch congestion, the SmartCell 6A000 implements standard resource management cell (RM-cell) marking, explicit forward congestion indicator cell marking (with backward RM cell marking), and early packet discard (EPD). These congestion control schemes are triggered when the number of cells within shared memory reaches user-definable thresholds. Use the **`switchtrafficcongestion`** commands to view and set these thresholds.

For example, enter the **`show switchtrafficcongestion`** command.

```
SmartCell ZX # show switchtrafficcongestion
Switch Traffic Congestion Parameters
================================================================================
Queue 1 EFCI Threshold                  : 4096 cells
Queue 2 EFCI Threshold                  : 4096 cells
Queue 3 EFCI Threshold                  : 4096 cells
Queue 4 EFCI Threshold                  : 4096 cells
Low EPD Threshold                       : 10922 cells
High EPD Threshold                      : 21845 cells
Switch Discard Threshold                : 30508 cells
RM Cell Marking Enable                  : ON
EFCI Cell Marking Enable                : ON
SmartCell ZX #
```

EFCI thresholds are set on a per-QoS-queue basis, while EPD thresholds are set with respect to the total amount of shared buffer used by all classes of service.

For most types of traffic, EPD triggering is tied to the low EPD threshold. Signaling traffic, however, is tied to the high EPD threshold; this assures that signaling packets are discarded only when congestion is most severe.

Use the **`set switchtrafficcongestion`** command to change thresholds for EFCI and EPD and to enable or disable RM and EFCI cell marking.

Along with EFCI and backward RM cell marking, the SmartCell 6A000 uses standard RM cell marking. The switch discard threshold (**`show switchtrafficcongestion`**) corresponds to total shared buffer utilization and represents the point at which the switch considers itself congested and starts marking RM cells.

Note The switch discard threshold is not user configurable and is shown only for information.

For information on troubleshooting congestion problems, see Chapter 5, “Troubleshooting.”

4.7 UPGRADING AND CHANGING SOFTWARE

This section describes the low-level boot load commands. Boot load commands are used for setting switch start-up behavior and for performing firmware downloads. Use the boot load commands to:

- Set which copy of the boot load firmware is the default copy
- Clear all configurations stored within the flash file system
- Check boot load firmware version numbers
- Load switch firmware upgrades
- Set whether power-on system tests (POST) are automatically run at start-up

4.7.1 Accessing the Boot Load Prompt

Boot load commands are executed from the boot load prompt. The boot load prompt is not part of the switch console, and is accessible only after a reboot and before the switch software is loaded. Consequently, the boot load commands can be used only through a terminal connection.

Perform the following steps to gain access to the boot load prompt:

1. Connect a dumb terminal (or PC running terminal emulation software) to the RJ-45 terminal port on the front of the SmartCell 6A000.
2. Enter the **`reboot`** command from the terminal.
3. Wait for the following message to appear:

   ```
   “Press any key to exit to boot load prompt.”
   ```

4. Before the countdown reaches zero, press a key to access the boot load prompt. Notice that the boot load prompt (=>) differs from the prompt used by the switch console.

4.7.2 Boot Load Commands

The following table describes the commands available from the boot load prompt, their use, and their associated parameters.

Table 4-4 Boot load commands

Command	Action	Parameters
chpi	**Change default boot load image:** Sets one of two images of the boot load software as the default. Default boot load image is executed at start-up.	**chpi 0** = set boot load image 0 as default **chpi 1** = set boot load image 1 as default
clfs	**Clear flash file system:** Clear flash file system of all switch configuration information.	none
dcfg	**Display boot load configuration:** Displays revision numbers of both boot load images, the switch MAC address, and the file space (in hexadecimal) available for additional MAC addresses. Shows whether POST is set to run at switch start-up.	none
df	**Download Software:** Downloads software images from a TFTP/Bootp server. Different components of the switch software are downloaded, depending on the parameter used with this command.	**df B** = download boot load software **df S** = download switch operating software **df P** = download diagnostics (POST) **df** (none) = download switch operating software
go	**Run switch software:** Exit the boot load prompt, and run switch operating software.	**go V** = run switch software, do not run POST **go P** = run POST before running switch software **go** (none) = run switch software, do not run POST
he	**Show help:** Displays help for a boot load command or displays list of all boot load commands.	**he** [<command>] = display help for command specified **he** = display list of all boot load commands
ponf	**POST on or off:** Changes start-up action: either run POST before running switch software or skip POST and go directly to switch software.	**ponf V** = run switch software after start-up timeout **ponf P** = run POST before running switch software

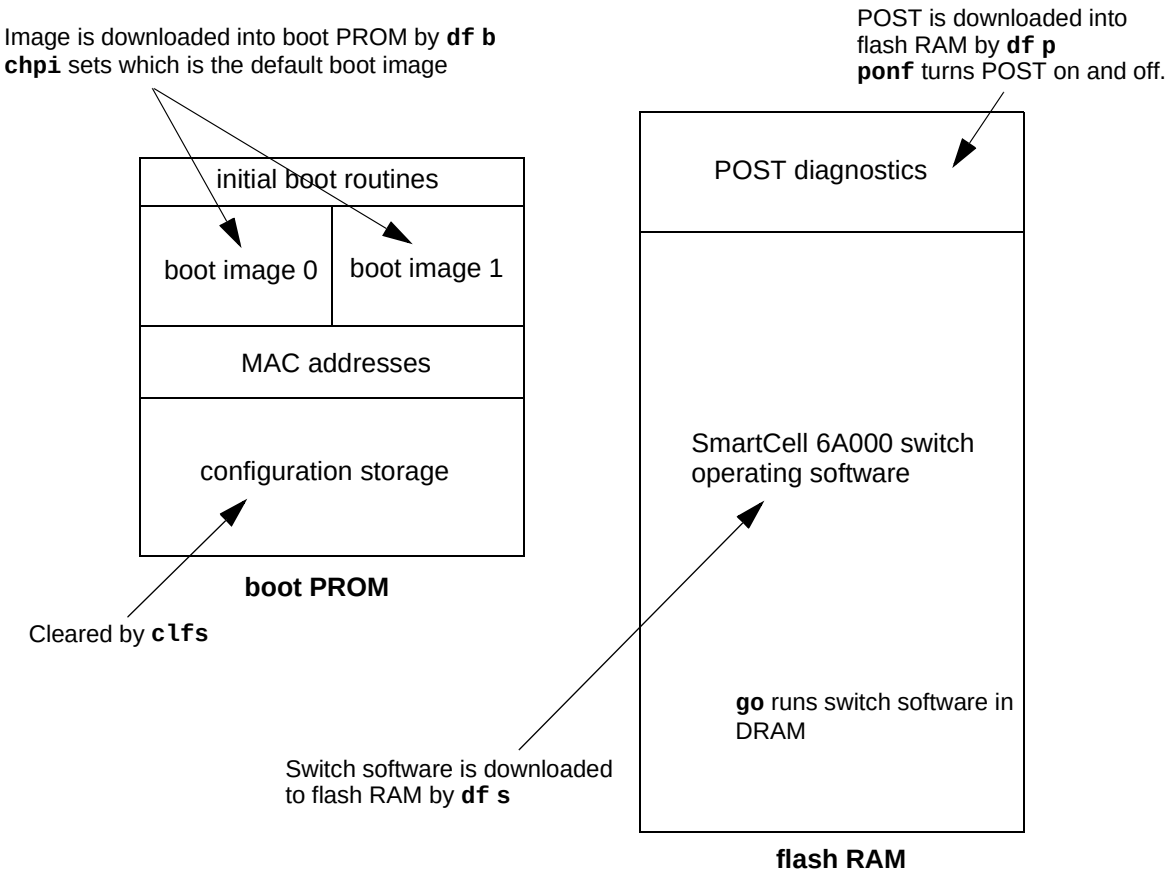
Image is downloaded into boot PROM by df b
chpi sets which is the default boot image
POST is downloaded into flash RAM by df p
ponf turns POST on and off.
initial boot routines
boot image 0
boot image 1
MAC addresses
configuration storage
boot PROM
POST diagnostics
SmartCell 6A000 switch operating software
go runs switch software in DRAM
flash RAM
Cleared by clfs
Switch software is downloaded to flash RAM by df s

Figure 4-4 Memory locations affected by the boot load commands

4.7.3 Upgrading Boot Load Software

Two images of the boot load software reside in flash RAM. The two images are identified as boot load image 0 and boot load image 1. Both boot load images can be upgraded by using a TFTP/Bootp server. However, an upgrade is always written over the boot load image that is not currently running. This insures that if a boot load upgrade fails, there is still one good boot load image to fall back on.

Follow the steps below to upgrade the switch boot load software.

1. Set up the TFTP/Bootp server software on a workstation.
2. Connect both the TFTP/Bootp server and the SmartCell 6A000 to your Ethernet network. Make sure that the TFTP/Bootp server can be reached by the SmartCell 6A000 Ethernet interface.
3. Connect a dumb terminal (or PC running terminal emulation software) to the SmartCell 6A000 Terminal port.
4. Copy the SmartCell 6A000 boot load software image into the appropriate location on the TFTP/Bootp server. (In this example, the software is copied to c:\tftpboot\images\boot.ima.)

5. Set up the TFTP/Bootp server tables (or equivalent file) with:
   - SmartCell 6A000 MAC address
   - IP address of the SmartCell 6A000 Ethernet interface
   - path to the image file on the TFTP/Bootp server
6. From the terminal connection, enter the **`reboot`** command.
7. When the following message appears,

   `"Press any key to exit to boot load prompt."`

   stop the countdown by pressing any key. The boot load prompt (=>) appears on the terminal screen.
8. Enter the **`df B`** command. The SmartCell 6A000 contacts the TFTP/Bootp server and downloads the file into the boot load image location that corresponds to the boot load image not currently running. For example, if boot load image 0 is running, **`df B`** downloads the file into boot load image 1, leaving boot load image 0 untouched.

```
=>df b
You've requested a Boot Load Software download
Are you sure?(Y/N)y
Initializing ethernet...
Starting Bootp...
   Boot file: c:\tftpboot\images\boot.ima
Using TFTP to get bootfile "c:\tftpboot\boot\boot.ima" .
..................................................
..............................................
Validity checks of the Boot Load Software Downloaded file...
All Validity checks OK
Programming downloaded image into Boot Load Software1 area, please wait...
New Boot Load Software programmed successfully.
Modifying Control/Stat field to reflect new image change, please wait...
Control/Stat field programmed successfully.
Please reboot to execute new Boot Load Software
=>
```

9. If the new boot load software passes the validity checks, it is marked as the new default image. In the example above, boot load image 1 becomes the new default image.
10. Reboot the SmartCell 6A000. The following message appears on the terminal screen:

```
Preparing to run Default Boot Load Software: 1
Enter 0 or 1 to override and force which Boot Load Software to run:

Default Boot Load Software1 Status Good
Boot Load Software1 Flash CRC checked OK
Copied Boot Load Software1 text into DRAM
Copied Boot Load Software1 data into DRAM
Default Boot Load Software Good
SmartCell ZX Start-up Code Version 1.0.1, Sep 18 1997
Copyright 1997, Cabletron Systems Inc.
```

11. Notice that boot load image 1 (`Boot Load Software1`) is specified as the new default image.

Changing the Default Boot Load Image

Continuing with the example above, perform the following steps to set boot load image 0 back to being the default.

1. Reboot the SmartCell 6A000.
2. When the following message appears

   ```
   "Preparing to run Default Primary Image: 1
   Enter 0 or 1 to override and force one of these primary image sectors to run:"
   ```

   press the zero (0) key. The SmartCell 6A000 loads boot load image 0.
3. Use the **chpi** command to make boot load image 0 the default.

```
=>chpi 0
Old Default Primary Image Number: 1
Erasing Sector in Primary Flash sector4
Programming control/stat info into Primary Flash sector4
New Default Primary Image Number: 0
=>
```

4. Reboot the SmartCell 6A000. Boot load image 0 is now used as the default image.

```
Preparing to run Default Primary Image: 0
Enter 0 or 1 to override and force one of these primary image sectors to run:
```

4.7.4 Upgrading POST Diagnostic Software

1. Set up the TFTP/Bootp server software on a workstation.
2. Connect both the TFTP/Bootp server and the SmartCell 6A000 to your Ethernet network. Make sure that the TFTP/Bootp server can be reached by the SmartCell 6A000 Ethernet interface.
3. Connect a dumb terminal (or PC running terminal emulation software) to the SmartCell 6A000 Terminal port.
4. Copy the SmartCell 6A000 diagnostic software image into the appropriate location on the TFTP/Bootp server. (In this example, the software is located at c:\tftpboot\images\post.ima.)
5. Set up the TFTP/Bootp server tables (or equivalent file) with:
   - SmartCell 6A000 MAC address
   - IP address of the SmartCell 6A000 Ethernet interface
   - path to the POST file on the TFTP/Bootp server
6. From the terminal connection, enter the **reboot** command.
7. When the following message appears,

   ```
   "Press any key to exit to boot load prompt."
   ```

   stop the countdown by pressing any key. The boot load prompt (=>) appears on the terminal screen.
8. Enter the **df P** command. The SmartCell 6A000 contacts the TFTP/Bootp server and downloads the diagnostic software into flash RAM.

```
=>df p
You've requested a POST Software download
Are you sure?(Y/N)y
Initializing ethernet...
Starting Bootp...
   Boot file: c:\tftpboot\images\post.ima
Using TFTP to get bootfile "c:\tftpboot\images\post.ima" .
.....................................................................
```

```
.....................................................................
.....................................................................
.....................................................................
.....................................
Validity checks of POST software Downloaded file...
All Validity checks OK
Programming downloaded image into POST Software section, please wait...
New POST Software programmed successfully
=>
```

9. Check whether the diagnostic download is successful by entering the **`go P`** command. This forces the SmartCell 6A000 to run POST before starting the switch software.

4.7.5 Upgrading Switch Operating Software

Note SmartCell 6A000 operating software can also be updated using the switch console **`update firmware`** command. See Section 4.7.6, “Using the Update Firmware Command.”

1. Set up the TFTP/Bootp server software on a workstation.

2. Connect both the TFTP/Bootp server and the SmartCell 6A000 to your Ethernet network. Make sure that the TFTP/Bootp server can be reached by the SmartCell 6A000 Ethernet interface.

3. Connect a dumb terminal (or PC running terminal emulation software) to the SmartCell 6A000 Terminal port.

4. Copy the SmartCell 6A000 switch operating software image into the appropriate location on the TFTP/Bootp server. (In this example, the software is located at c:\tftpboot\images\server.ima.)

5. Set up the TFTP/Bootp server tables (or equivalent file) with:

- SmartCell 6A000 MAC address
- IP address of the SmartCell 6A000 Ethernet interface
- path to the POST file on the TFTP/Bootp server

6. From the terminal connection, enter the **`reboot`** command.

7. When the following message appears,

```
“Press any key to exit to boot load prompt.”
```

stop the countdown by pressing any key. The boot load prompt (=>) appears on the terminal screen.

8. Enter the **`df s`** command. The SmartCell 6A000 contacts the TFTP/Bootp server and downloads the switch operating software into flash RAM.

```
=>df s
You've requested a Switch Software download
Are you sure?(Y/N)y
Initializing ethernet...
Starting Bootp...
   Boot file: c:\tftpboot\images\server.ima
Using TFTP to get bootfile "c:\tftpboot\images\server.ima" .
.....................................................................
.....................................................................
.....................................................................
.....................................................................
```

```
.....................................................................
.............................................
Validity checks of the Switch Software Downloaded file...
All Validity checks OK
Programming downloaded image into Switch Software section, please wait...
New Switch Software programmed successfully
=>
```

9. Check whether the switch download is successful by entering the **go** command.

4.7.6 Using the Update Firmware Command

You can upgrade the operating software of the SmartCell 6A000 while the switch is running its current software. This procedure is known as a hot upgrade and is accomplished by the **update firmware** command.

When the 6A000 switch is started (or rebooted), it copies its operating software from flash RAM to the CPU's program memory. When a hot upgrade is performed, the image in flash RAM is erased and replaced with the new software image. While the upgrade is occurring, the switch continues to run its copy in program memory. When the switch is rebooted, the new software image residing in flash RAM is copied into system memory and then run.

To use the hot upgrade feature, the SmartCell 6A000 must have network access to an end station running TFTP server software. The SmartCell 6A000 operating software file must reside within the directory specified by the TFTP server software. Often, this directory is /tftpboot. However, it may be different with your TFTP server software.

The following is an example of a hot upgrade:

```
SmartCell ZX # update firmware
ServerIP()                                : 214.95.77.240
Path()                    : luxor/server.ima
You are updating the code image in the flash.
Are you sure this is what you want to do?
Confirm(y/n)?:y
Verifying bootfile luxor/server.ima on 214.95.77.240... passed.
Erasing Flash.
Using TFTP to get and program bootfile luxor/server.ima from 204.95.77.240.
2785K (2852012 bytes) received.
Flash update succeeded.
You will have to reboot for the new image to take effect.
SmartCell ZX #
```

Notice that the **update firmware** command does not use Bootp to find the TFTP server. Instead, the **update firmware** command requires that you specify the IP address of the TFTP server, the path to the image file, and the file name.

Unsuccessful Update

If the **update firmware** command fails, DO NOT turn off or attempt to reboot your SmartCell 6A000 switch. In its current state, the operating software normally stored in flash RAM is erased. The switch is functioning only because it is running the image of the operating software that resides in volatile system memory.

If possible, determine why the **update firmware** command failed. Common causes for failure are:

- Incorrect path and file names
- Improper permission settings on the directory containing the upgrade software
- SmartCell 6A000 is not physically connected to the network
- SmartCell 6A000 cannot reach the TFTP server's subnet

If the problem is corrected, enter the **update firmware** command to continue with the upgrade process. However, if you are unable to correct the problem, use the **df** (download flash) command and a TFTP/Bootp server to replace the operating software on your SmartCell 6A000. Follow the procedure outlined below:

1. Set up TFTP/Bootp server software on a workstation.
2. Connect both the TFTP/Bootp server and the SmartCell 6A000 to your Ethernet network. Make sure that the TFTP/Bootp server can be reached by the SmartCell 6A000 Ethernet interface.
3. Connect a dumb terminal (or PC running terminal emulation software) to the SmartCell 6A000 Terminal port.
4. Copy the SmartCell 6A000 operating software image into the appropriate location on the TFTP/Bootp server.
5. Set up the TFTP/Bootp server tables (or equivalent file) with the SmartCell 6A000 MAC address and IP address. You may also need to specify the path to the image file to be downloaded.
6. From the terminal connection, enter the **reboot** command.
7. When the following message appears,

   ```
   "Press any key to exit to boot load prompt. "
   ```

   stop the countdown by pressing any key. The boot load prompt (=>) appears on the terminal screen.
8. Enter the **df s** command. The SmartCell 6A000 contacts the TFTP/Bootp server and downloads the operating software into its flash RAM.

```
=>df s
You've requested a Switch Software download
Are you sure?(Y/N)y
Initializing ethernet...
Starting Bootp...
   Boot file: c:\tftpboot\images\server.ima
Using TFTP to get bootfile "c:\tftpboot\images\server.ima" .
.....................................................................
.....................................................................
.....................................................................
.....................................................................
.................................................
Validity checks of the Switch Software Downloaded file...
All Validity checks OK
Programming downloaded image into Switch Software section, please wait...
New Switch Software programmed successfully
=>
```

9. Enter the **go** command to start the SmartCell 6A000.

4.8 SAVING CORE DUMPS

The SmartCell 6A000 core dump feature allows you to specify a local Ethernet host where, in the event of a system failure, the SmartCell 6A000 sends a copy of its memory. SmartCell 6A000 system memory is saved to two files, one containing CPU memory (`core_cpu`), the other common memory (`core_cmn`). These files can then be sent to Cabletron customer support for analysis.

Note To use the core dump feature, the local Ethernet host must be running TFTP server software, and you must have write access to the TFTP directory.

Enter the **`set CoreDump`** command to enable the core dump feature. For example,

```
SmartCell ZX # set coredump
EnableCoreDump(n)                    : y                          < "y" to enable core dump feature
ServerIP()                           : 204.95.77.240              < IP address of my TFTP server
CoreDumpFile()                       : /tftpboot/bobr/core        < full path name for core dump files
userName()                           : bobr                       < login name on the server
UserPassword()                           :                        < password
SmartCell ZX #
```

Note The **`set CoreDump`** command uses FTP to create the `core_cpu` and `core_cmn` files. If your server does not run FTP, create these files manually. Then execute the **`set CoreDump`** command.

Note On UNIX systems, make sure that the permissions are set correctly so that data can be written.

Note For security, the **`set CoreDump`** command retains your password only long enough to create the core dump files. Your password is then dropped from system memory.

To see the current core dump configuration, enter the **`show coredump`** command.

```
SmartCell ZX # show coredump

Core Dump Enabled   : Yes
Core Dump Server IP : 204.95.77.240
Core Dump File      : /tftpboot/bobr/core

SmartCell ZX #
```

If a system failure occurs while the core dump feature is enabled, the SmartCell 6A000 console appears similar to the example below. The SmartCell 6A000 then begins sending images of its memory to the core dump files on the TFTP server.

```
Illegal access. Bus Error.
IP: e0103288    PFP: e04be080
r0(pfp): e04be040         r1(sp): e04be0c0        r2(rip): e00dd7dc
r3     : 00000000         r4    : e00f8f0c        r5     : e0409f10
r6     : 00000003         r7    : e00f8f0c        r8     : e0409f40
r9     : 00000003         r10   : 00000030        r11    : e00f8f0f
r12    : 00000008         r13   : 00000001        r14    : e00d22f0
r15    : 00000008
d2000000:  Core Dump
Common DRAM dumped to /tftpboot/bobr/core_cmn
CPU DRAM dumped to /tftpboot/bobr/core_cpu
ffffffff ffffffff ffffffff ffffffff   *................*
d2000010:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000020:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000030:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000040:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000050:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000060:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000070:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000080:  ffffffff ffffffff ffffffff ffffffff   *................*
d2000090:  ffff
SmartCell ZX Start-up Code
Cabletron Systems Inc.
```

Copy the information displayed on the console and send it to your Cabletron customer support representative along with the core dump files.

5 TROUBLESHOOTING

This chapter provides basic troubleshooting for diagnosing and fixing problems with VLAN, emulated LANs, and ATM traffic congestion.

5.1 TROUBLESHOOTING IP OVER ATM

You have configured an IP over ATM VLAN, but your network applications are not working. Use these questions and tests to help determine the cause of the problem.

1. Check for connectivity: Try pinging between end nodes and from the SmartCell 6A000 (using **`start ping`**) to its end nodes. If you cannot ping, check physical connectivity (disconnected cable and so on).
2. Check IP routes and addresses.

- Use the **`show route`** command to check the SmartCell 6A000 route table.
  - Are the destination addresses correct for the specified gateways?
  - Are there any routing loops?
  - Are one or more of the destination addresses mapped to the wrong subnet?
- Use **`show client`** (ARP server is on SmartCell 6A000) to check the local client.
  - Does the client have the correct IP address?
  - Is the subnet correct? Is the ATM address correct?
  - Is the server type correct?
- Check end node configurations.
  - Are end nodes configured correctly?

3. Check ARP statistics.

- Use **`show ipatmarp`** (if the ARP server is on the SmartCell 6A000).
  - Are there entries in the table?
  - Are the ATM addresses correct?
- Use **`show clientarp`** (ARP server is not on SmartCell 6A000) to check local client's ARP Table.
  - Are there entries in the table? If not, recheck client and end node configuration.
  - Are the ATM addresses correct?

4. Check ILMI, UNI routes, and PVCs (if applicable).

- If using SVCs, use **`show ATMRoute`** to check whether static UNI routes are correct and whether dynamic UNI routes are established and correct. If dynamic routes are incorrect or missing, try creating static routes instead.
- If using PVCs, use **`show pvc`** to check if PVCs connect the correct resources through the correct ports.
- If using PVCs, use **`show ipatmpvc`** to check if local switch clients are mapped to the correct end node IP addresses.

5. If working through these questions does not solve the problem, contact Cabletron Systems Customer Service. (See Appendix C, “Technical Support.”)

5.2 TROUBLESHOOTING LAN EMULATION

You have configured an Emulated LAN and your network applications are not working. Use these questions and tests to help determine the cause of the problem.

1. Check for connectivity. Try pinging between end nodes. Ping from the SmartCell 6A000 (using **`start ping`**) to its end nodes. If you cannot ping, check physical connectivity (disconnected cable and so on).
2. Check IP routes and addresses.

- Use **`show route`** command to check the SmartCell 6A000 route table.
  - Are the destination addresses correct for the specified gateways?
  - Are there any routing loops?
  - Are one or more of the destination addresses mapped to the wrong subnet?
- Use **`show client`** to check the SmartCell 6A000 local ELAN client.
  - Does the client have the correct IP address?
  - Is the subnet correct?
  - Is the ATM address correct?
  - Is the server type correct?
- Check end nodes configurations.
  - Are end nodes configured correctly?

3. If the ELAN spans multiple switches, check the following:
   - Is the LECS address correct on all switches?
   - Can all switches reach the switch providing LECS support?
   - If using the Well Known LECS Address, are all switches correctly mapped?
4. Check the LECS database.

- Use **`show lecselan`** to check the names and numbers of ELANs.
  - Are ELAN names correct?
  - Is the ATM address of the LES correct?

5. Check whether BUS is connected.

- Use **`show busclient`** to check whether devices are registered with the BUS. If clients are registered, check end node configuration. If not registered, check multi-point signaling.
- Use **`set leselan`** to turn off multi-point signaling on a per-ELAN basis.
  - Do devices begin to register with the LES and BUS once multi-point signaling is turned off?
- Check IISP routes to the switch containing the LES and BUS.
  - Are all IISP routes correct?
  - Does a new IISP route need to be added so devices can reach the LES and BUS?

6. If working through these questions does not solve the problem, contact Cabletron Systems Customer Service. (See Appendix C, “Technical Support.”)

5.3 TROUBLESHOOTING PNNI LINKS

You have physically connected another company’s ATM switch with your SmartCell 6A000. Each switch supports PNNI, but there is no connectivity between the two devices. Use the following procedure to diagnose and resolve the problem.

Examine the link state on each switch (**`show PNNILink`** on SmartCell 6A000).

- If the link does not appear in the Link list, check the following:
  - Is the connecting port on each switch configured for PNNI? If no, configure both ports for PNNI.

Note On the SmartCell 6A000, use the **`show portconfig`** command to determine whether the port is PNNI. If **`show portconfig`** displays **`autoConfig`** as the port configuration, use the **`set portconfig`** command to disable ILMI and manually set the port to PNNI.

  - Examine the VCC masks for each switch. Are the switches using compatible VPI/VCI pairs? If not, adjust the VCC mask so that both switches use compatible VPI/VCI pairs.
- If link state is “attempt,” check the following:
  - Is the PNNI peer group ID the same on both switches? If not, set both peer group IDs to the same value.
  - Is the PNNI node ID the same for both switches? If not, set the PNNI node ID to the same value. Especially check that the first two octets (peer-group level and lowest-level node) of the node ID are the same for both switches.
- If the link state is “2WayInside,” check the ATM route tables on each switch (**`show ATMRoute`** on SmartCell 6A000).
  - If the switches are supporting end systems or have clients, does the net prefix of each switch appear in the ATM route table of the other?

    If no, check both switches for signaling and ILMI misconfiguration.

    If yes, contact Cabletron Systems Customer Service.

5.4 TROUBLESHOOTING CONGESTION

If the bandwidth of your SmartCell 6A000 begins to decrease, and if connections are being lost or packets are being dropped at a high rate, it’s possible that your switch is becoming congested. Congestion can occur on the port level, the global switch level, or both levels.

If you suspect that your SmartCell 6A000 switch is experiencing congestion, follow the steps outlined below to diagnose and resolve the cause of congestion.

5.4.1 Diagnosing Congestion

1. Enter the **`show portstats`** command, and take the default of (**`all`**).
2. If cells are not being dropped on all ports, proceed to the “Port Congestion” section.
3. If cells are being dropped on all ports, the indication is global congestion. Proceed to the “Global Congestion” section.

5.4.2 Global Congestion

1. Is the total cell drop rate equal to the Unknown VC cell drop rate?

- If yes, the switch is improperly set up. Check the switch configuration.
- If no, this indicates global congestion. Continue.

2. Set the **`porttrafficcongestion`** values to those recommended in the “QoS Queue Allocation Guidelines” section. Has the congestion subsided?

- If yes, you are done.
- If no, continue.

3. Have you changed the EPD threshold?

- If yes, replace it to the default setting. If congestion subsides, you are done.
- If no, continue.

4. Enter the **`show cacinfo`** command for each port. Is the allocated bandwidth small and is the traffic mostly UBR?

- If no, go back to step 4 and check next port.
- If yes, continue.

5. Enter the **`show porttrafficcongestion`** command. Is the UBR queue Max threshold large?

- If no, go back to 4.
- If yes, continue.

6. Reduce the UBR queue Max threshold by a small amount, then wait a few minutes.
7. Enter the **`show portstats`** command, and take the default of **`all`**. Is the number of cells dropped increasing for this port, and quickly decreasing for all other ports?

- If yes, proceed to the “Port Congestion” section.
- If no, continue.

8. Is the number of cells being dropped by all other ports decreasing somewhat?

- If no, go back to step 6.
- If yes, continue.

9. Enter the **`set caceqbwallocscheme`** command and set call admission control for this port to a more conservative policy (**`moderate`** or **`conservative`**).
10. Go back to step 4 until all ports have been checked.

5.4.3 Port Congestion

1. Enter the **`show portstats`** command a few times, noting the value for cells dropped and unknown VCs dropped. Is the difference for cells dropped equal to the difference for VCs dropped?

- If yes, the switch is improperly set up. Check the switch configuration.
- If no, this indicates port congestion. Continue.

2. Enter the **`show cacinfo`** command for this port. Note the bandwidth allocated for each Quality of Service on this port.
3. For each class of service, enter the **`set porttrafficcongestion`** command. Set the Max threshold to the value recommended in the "Quality of Service Queue Allocation Guidelines" section.
4. Have you performed step 3 for every class of service for this port?

- If no, go to step 3.
- If yes, continue.

5. Enter the **`set caceqbwallocscheme`** command for this port. Set call admission control for this port to a more conservative policy (**`moderate`** or **`conservative`**).
6. Check VC statistics for this port using either the **`show pvc /d`** or **`show svc /d`** command, whichever is appropriate.
7. If the port belongs to the high virtual channel link (VCL), read the forward stats. If the port belongs to the low VCL, read the backward stats. If the port belongs to both high and low VCLs, read both stats.
8. Is the number of cells received increasing?

- If no, go step 6.
- If yes, continue.

9. Convert allocated bandwidth (kb/s) to cells (48 bytes).

   Bandwidth in cells = (1024 X Allocated Bandwidth) / 384
   where 384 = 48 cells X 8

10. Is the Allocated Bandwidth less than the Cell Reception Rate?

- If no, go to step 6.
- If yes, this VC is misbehaving. Take appropriate action, for example, terminate the VC.

APPENDIX A SPECIFICATIONS

This appendix describes SmartCell 6A000 switch hardware, product features, technical specifications, and adapter pin-out descriptions.

A.1 FRONT PANEL

This section describes the hardware components of the SmartCell 6A000 ATM switch.

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Table A-1 Front panel LEDs

LED	Function
FAIL (red)	Normally OFF; ON indicates CPU failed.
STATUS (amber)	Normally OFF; ON indicates an error condition that prevents alarm information from being displayed to the console.
POWER (green)	Normally ON; OFF indicates the CPU is receiving power from the power supply.
RX DATA (green)	Normally FLASHING intermittently if there is receive activity on the port; indicates the Ethernet port is up and receiving Ethernet frames.
TX DATA (green)	Normally FLASHING intermittently if there is transmit activity on the port; indicates the Ethernet port is up and transmitting Ethernet frames.

Note The ‘MON' and ‘DIAG' functions are not used in this release.

Figure A-1 illustrates the front panel of the SmartCell 6A000 switch.

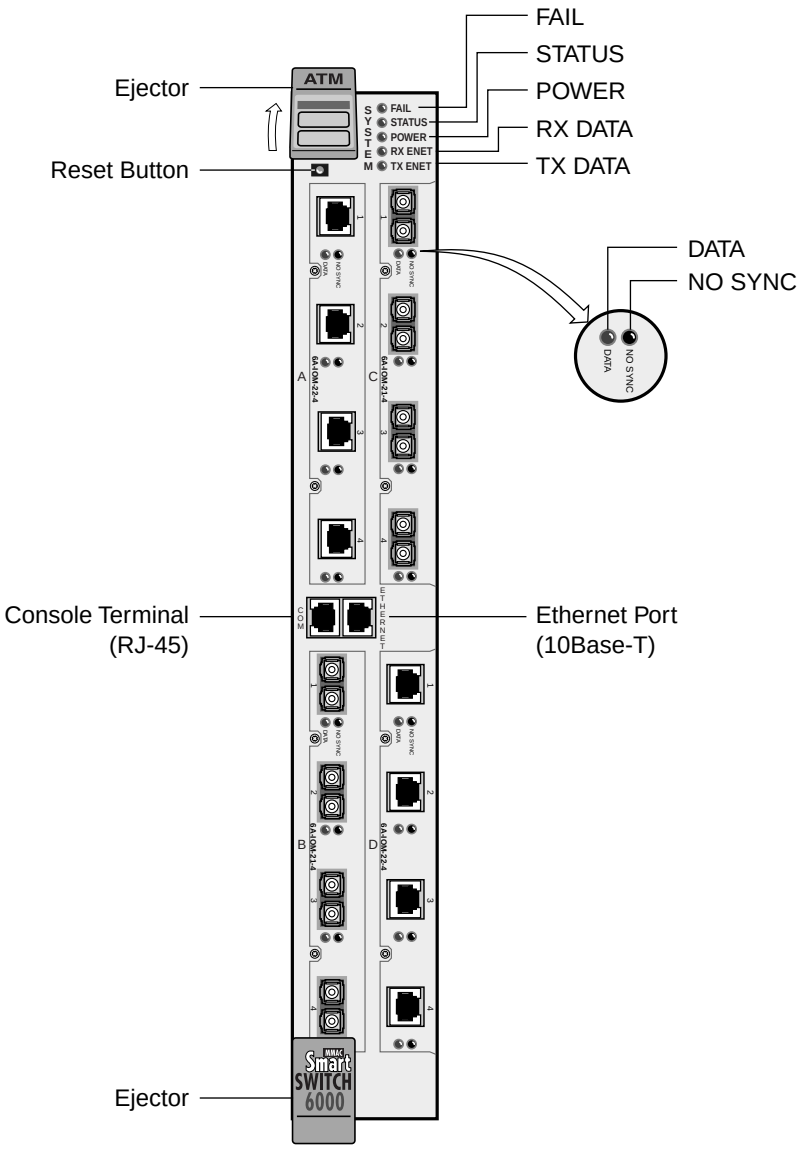

Figure A-1 Front panel

A.2 TECHNICAL SPECIFICATIONS

Table A-2 Hardware Specifications

Specification	Value
Processor	i960CF, 33 MHz
Switching engine	2.5 Gbps, non-blocking

Table A-2 Hardware Specifications (Continued)

Specification	Value
Max I/O ports	7 for 6A000-02; 15 for 6A000-04
Switch latency	10 microseconds
CPU DRAM memory	32 MB
Buffer memory (cells)	32 K
flash memory	8 MB
Serial port	RS-232c compliant; RJ-45 connector
Ethernet port	IEEE 802.3 compliant; RJ-45 connector

Table A-3 Physical Specifications

Specification	Value
Dimensions	41.9 cm x 6.1 cm x 28.6 cm 16.5" x 2.4" x 11.25"
Product weight (with max I/O modules)	3.6 kg 8 lbs
Power requirements (typical)	5V, 19 amps at chassis power bus (fully loaded)
Power dissipation (typical)	1,008,000 BTU/s (95 watts) (fully loaded)
Operating temperature	15 to 40 C (41 to 104 F)
Operating humidity	5% to 90% RH, non-condensing

Table A-4 ATM Port Specifications

Media	Port Speed	Framing	Connector	Max. Tx Power	Min. Tx power	Max. Rx power	Min. Rx power	Range
SMF-IR	155 Mbps or 622 Mbps	STS-3 or STM-1 STS-12 or STM-4	SC	-8 dBm	-15 dBm	-7 dBm	-28 dBm	15 Km
SMF-LR	622 Mbps	STS-12 or STM-4	SC	--	-3 dBm	-7 dBm	-28 dBm	40 Km
MMF	155 Mbps or 622 Mbps	STS-3 or STM-1 STS-12 or STM-4	SC	-19 dBm	-14 dBm	-14 dBm	-31 dBm	2 Km

Table A-4 ATM Port Specifications (Continued)

Media	Port Speed	Framing	Connector	Max. Tx Power	Min. Tx power	Max. Rx power	Min. Rx power	Range
Cat. 5 UTP	155 Mbps	STS-3 or STM-1	RJ-45	v	--	--	--	100 m
75 ohm coax	44.7 Mbps	DS-3 nonchannelized	BNC, female	n/a	n/a	n/a	n/a	150 m to DSX
75 ohm coax	44.7 Mbps	DS-3 nonchannelized	BNC, female	n/a	n/a	n/a	n/a	150 m to DSX
75 ohm coax	34.3 Mbps	E-3 nonchannelized	BNC, female	n/a	n/a	n/a	n/a	150 m to DSX

Table A-5 Protocols Standards and Specifications

Protocol	Standard
Signaling	ATM Forum UNI 3.0 ATM Forum UNI 3.1 ATM Forum UNI 4.0 ATM Forum ILMI 4.0
ATM routing protocols	IISP PNNI Phase 1.0 UNI
LAN protocols	ATM Forum LANE 1.0 (Ethernet and Token Ring) IETF RFC 1577 Classical IP over ATM

Table A-6 Management Standards and Specifications

Management Protocol	Supported MIBs
SNMPv2c	MIB II (RFC 1213)
	Interface Table MIB (RFC 1573)
	AToM MIB (RFC 1695)
	AToM2 MIB (pre-standard)
	LANE MIB (ATM Forum)
	ILMI 4.0 MIB (ATM Forum)
	IP over ATM MIB (pre-standard)
	PNNI MIB
	Switch hardware MIB

Table A-7 RJ-45 to DB-9 Adapter (PC Serial Port Adapter)

RJ-45 Pin	RJ-45 Color	DB-9 Pin	DB-9 Description
1	Blue	2	Receive
4	Red	3	Transmit
5	Green	5	Ground

APPENDIX B AGENT SUPPORT

This appendix briefly describes the support provided for managing the SmartCell 6A000 using Simple Network Management Protocol (SNMP).

B.1 MIB, SMI, MIB FILES AND INTERNET MIB HIERARCHY

A MIB (Management Information Base) is the term used to represent a virtual store of management data on a device. Given the structure of management data, it can be operated upon (retrieved, created or modified) using the SNMP protocol. The structure of that data is defined using a subset of a notation called Abstract Syntax Notation (ASN.1). This subset is called SMI (Structure of Management Information). A file containing the definition of that structure is called a MIB file. To provide for a uniform naming convention for all MIBs, from all vendors, for all kinds of data, a standard format is used. This format is a hierarchy and is termed the Internet MIB Hierarchy.

The MIB structure is logically represented by a tree hierarchy (see Figure B-1). The root of the tree is unnamed and splits into three main branches: Consultative Committee for International Telegraph and Telephone (CCITT), International Organization for Standardization (ISO), and joint ISO/CCITT.

These branches and those that fall below each category have short text strings and integers to identify them. Text strings describe object names, while integers allow computer software to create compact, encoded representations of the names. For example, the ZeitNet MIB variable znIpAtmClient is an object name and is also represented by the number one.

An object identifier in the Internet MIB hierarchy is the sequence of numeric labels on the nodes along a path from the root to the object. The object for the Internet Standard for MIB II is represented by the object identifier 1.3.6.1.2.1. It also can be expressed as iso.org.dod.internet.mgmt.mib (see Figure B-1).

Note For the authoritative reference on the concepts described in this section, refer to RFCs 1901 through 1908.

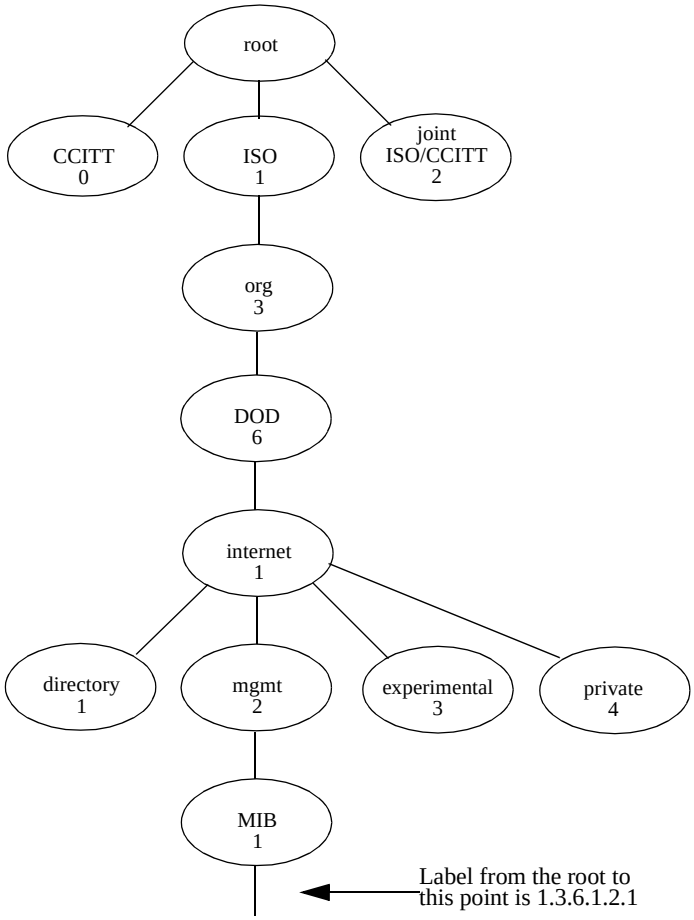

Figure B-1 Internet MIB hierarchy

B.1.1 ZeitNet Cabletron Proprietary MIBs

The location of some of ZeitNet proprietary MIBs in the Internet hierarchy is shown in Figure B-2. All nodes starting with “zn” represent Zeitnet objects.

The private ZeitNet MIB is represented by the object identifier 1.3.6.1.4.1.1295, or iso.org.dod.internet.private.enterprise.zeitnet. The ZeitNet proprietary MIBs include the subtrees shown in Figure B-2.

.

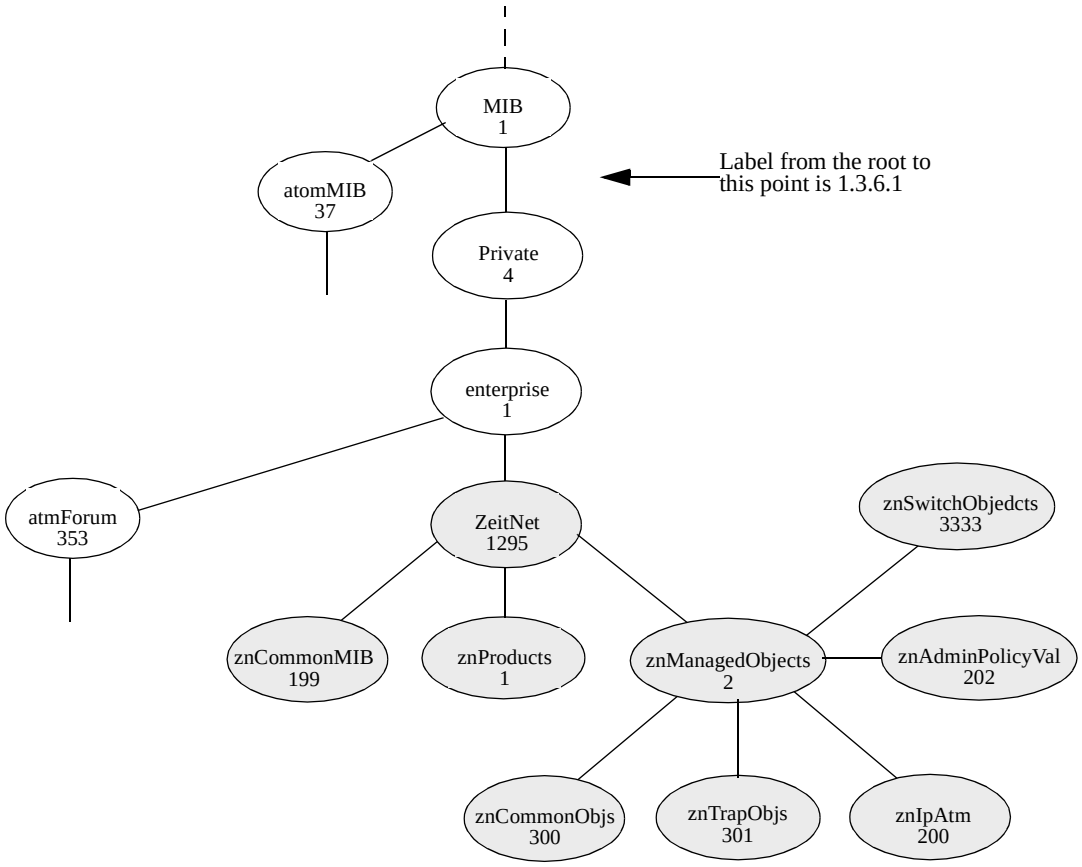

Figure B-2 ZeitNet Private MIBs

In Figure B-2, the ZeitNet proprietary group is identified by 1.3.6.1.4.1.1295; its subgroup, called znProducts, is identified by 1; and the first variable is znManagedObjects with a value of 2. Therefore, the object znManagedObjects has an object identifier of 1.3.6.1.4.1.1295.2.

B.1.2 Relation Between Object Identifier and the Represented Value

In Figure B-3, the znLec object (representing Lan Emulation Client information) has an Object Identifier of 1.3.6.1.4.1.1295.2.3333.9.1.1. The znLecDDCount object representing the number of Data direct connections maintained by one LEC (Lan Emulation Client) has a object identifier of 1.3.6.1.4.1.1295.2.3333.9.1.1.1.1. Querying for the value represented by this object identifier (using the SNMP protocol), returns the actual number of data direct connections for the identified LEC.

:

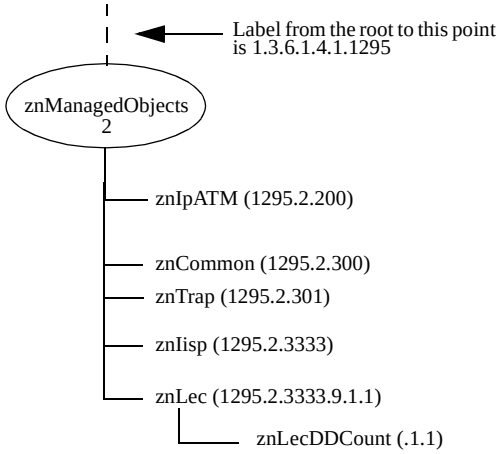

Figure B-3 ZeitNet Cabletron 6A000 MIB object identifier example

B.1.3 Supported protocols

The SmartCell 6A000 supports Simple Network Management Protocol (SNMP). Both the SNMPv1 and SNMPv2c formats of the protocol are supported.

B.1.4 Supported SMI Formats

Zeitnet proprietary MIBs are defined using SNMPv2 format of the SMI.

B.1.5 Zeitnet Cabletron Proprietary MIB Groups

The following table of Zeitnet proprietary MIB groups lists group name, object identifier, and group function.

Table B-1 Zeitnet proprietary MIB groupings

Name	Object Identifier	Function
zeitnet	1.3.6.1.4.1.1295	All Zeitnet Proprietary Objects
znProducts	1.3.6.1.4.1.1295.1	ZeitNet product specific
znManagedObjects	1.3.6.1.4.1.1295.2	Various classes of Managed entities
znIpAtm	1.3.6.1.4.1.1295.2.200	IP ATM services
znIpAtmClient	1.3.6.1.4.1.1295.2.200.1	IP ATM Client Services

Table B-1 Zeitnet proprietary MIB groupings (Continued)

Name	Object Identifier	Function
znIpAtmServer	1.3.6.1.4.1.1295.2.200.2	IP ATM Server Services
znCommonObjs	1.3.6.1.4.1.1295.2.300	Zeitnet Specific Information
znTrapObjs	1.3.6.1.4.1.1295.2.301	ZeitNet Traps
znSwitchObjects	1.3.6.1.4.1.1295.2.3333	Switch/hardware specific information
znSystem	1.3.6.1.4.1.1295.2.3333.1	Hardware and software system level information
znSwitchDiscoveryTable	1.3.6.1.4.1.1295.2.3333.1.34	Neighbor switch configuration
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B.1.6 SmartCell 6A000 MIB Support

The SmartCell 6A000 is shipped with the following MIBs:

- MIB II (RFC 1213)
- Interface Table MIB (RFC 1573)
- AToM MIB (RFC 1695)
- AToM2 MIB (pre-standard)
- LANE MIB (ATM Forum)
- ILMI 4.0 MIB (ATM Forum)
- IP over ATM MIB (pre-standard)
- SmartCell 6A000 Switch MIBs (proprietary)

Note Along with the MIBs, the diskette also contains a README file and the release note.

B.1.7 MIB Exceptions

With the current implementation of MIB files, conformance to ATM standards for the SmartCell 6A000 ATM switch includes the following exceptions.

Non-Conformance

- atmInterfaceIlmiVpi — Read-only
- atmInterfaceIlmiVci — Read-only
- aal5VccTable — Not supported
- atmSvcVcCrossConnectRowStatus Set — Not supported
- atmConfigSigType — The values given below are not supported:
  - ituDss2
  - atmfBici2Dot0
- znIpAtmClientDDVcType — Accepts only pvc(2) in sets
- lecMulticastSendType — Accepts only best effort (1)
- lecMulticastSendAvgRate — Accepts values only up to 370370
- lecMulticastSendPeakRate — Accepts values only up to 370370
- leArpEntryType — Accepts only staticVolatile (4) and staticNonVolatile (5)
- lesControlTimeout — Read-only

Not Supported

The following MIB objects are not supported. If used, these objects return either the value zero or the message, “Not supported.”

- atmInterfaceMaxVpcs
- atmInterfaceConfVpcs
- atmInterfaceDs3PlcpTable
- atmInterfaceTCTable
- atmVplTable
- atmVpCrossConnectIndexNext
- atmVpCrossConnectTable
- atmSvcVpCrossConnectTable
- atmSigSupportTable
- atmSigDescrParamTable

- atmIfAdminAddrTable
- atmVclAddrBindTable
- atmAddrVclTable
- atmVplStatTable
- atmVplLogicalPortTable
- atmVclGenTable
- atmfMyOsiNmNsapAddress
- atmfVpcTable
- lecRouteDescrTable
- leRDArpTable

B.2 MANAGING THE SMARTCELL 6A000

Your SmartCell 6A000 must be IP reachable by the NMS before it can be managed. The default connection between the SmartCell 6A000 and the NMS is the SmartCell 6A000 Ethernet interface. Use the **`show SwitchConfig`** command to find the IP address of the SmartCell 6A000. An NMS can use this IP address to reach the SmartCell 6A000 through Ethernet. An NMS can also manage the SmartCell 6A000 through one of its ATM ports if the SmartCell 6A000 has a client connection into a VLAN or emulated LAN.

Note that the SmartCell 6A000 itself, is not reachable through ATM until a client for the switch is created and participates as a member of a VLAN or ELAN. Your NMS uses that switch client's address to access and manage the switch.

To create a client for the switch, use the **`add IPATMClient`** command for VLANs and **`add LANEClient`** for emulated LANs.

Use the **`set MyNmAddr`** command to tell the SmartCell 6A000 which interface to use when communicating with your NMS. For detailed information about these commands, see the SmartCell 6A000/ZX-250 Reference Manual.

B.2.1 Console Commands that Affect the Agent

The following is a list of the console commands that affect the operation of the SmartCell 6A000 SNMP agent. For detailed descriptions of these commands, see the SmartCell 6A000/ZX-250 Reference Manual.

- Community: Sets the community strings for the SmartCell 6A000
- TrapCommunity: Specifies the NMS to which traps are sent
- MyNMAddr: Specifies the IP address through which the switch is managed
- TrustedNMS:Specifies the IP address of the NMS allowed to perform the following commands:
  - **`update firmware`**
  - **`backup`**
  - **`restore`**
  - **`reboot`**

APPENDIX C TECHNICAL SUPPORT

This appendix tells you what to do if you need technical support for your SmartCell 6A000 switch.

Cabletron offers several support and service programs that provide high-quality support to our customers. For technical support, first contact your place of purchase. If you need additional assistance, contact Cabletron Systems, Inc. There are several easy ways to reach Cabletron Customer Support and Service.

C.1 TELEPHONE ASSISTANCE

Our Technical Support Center is available Monday through Friday, 8am to 8pm Eastern Time, by calling 603-332-9400.

C.2 FAX SERVICE

You can fax support questions to us any time at 603-337-3075.

C.3 ELECTRONIC SERVICES

You can contact Cabletron's Bulletin Board Service by dialing 603-335-3358.

Our internet account can be reached at support@ctron.com.

You can also check our home pages on the World Wide Web.

- http://www.Cabletron.com
- http://www.ctron.com

C.4 PLACING A SUPPORT CALL

To expedite your inquiry, please provide the following information:

- Your Name
- Your Company Name
- Address
- Email Address
- Phone Number
- FAX Number

- Detailed description of the issue (including history, what you've tried, and conditions under which you see this occur)
- Hardware model number, software version, and switch configuration (that is, what part types are in what slots)

C.5 HARDWARE WARRANTY

Cabletron warrants its products against defects in the physical product for one year from the date of receipt by the end user (as shown by Proof of Purchase). A product that is determined to be defective should be returned to the place of purchase. For more detailed warranty information, please consult the Product Warranty Statement received with your product.

C.6 SOFTWARE WARRANTY

Cabletron software products carry a 90-day software warranty. During this period, customers may receive updates and patches for verified, reported software issues.

C.7 REPAIR SERVICES

Cabletron offers an out-of-warranty repair service for all our products at our Santa Clara Repair Facility. Products returned for repair will be repaired and returned within 5 working days. A product sent directly to Cabletron Systems, Inc. for repair must first be assigned a Return Material Authorization (RMA) number. A product sent to Cabletron Systems, Inc., without an RMA number displayed outside the box will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, contact the Cabletron Technical Support. When you call for an RMA number, your support representative will spend a few minutes with you, making sure the board is defective. Once they confirm the board is defective, they will assign an RMA number. Payment, shipping instructions, and turnaround time will be confirmed when the RMA number is assigned.

APPENDIX D ACRONYMS

A

AAL	ATM Adaptation Layer
AAL1	ATM Adaptation Layer Type 1
AAL2	ATM Adapter Layer Type 2
AAL3/4	ATM Adapter Layer Type 3/4
AAL5	ATM Adapter Layer Type 5
AALM	ATM Adaptation Layer Mux
ABR	Available Bit Rate
AFI	Authority and Format Identifier
ANSI	American National Standards Institute
API	Application Programming Interface
ARP	Address Resolution Protocol
ASCII	American Standard Code for Information Interchange
ATM	Asynchronous Transfer Mode
AvCR	Available Cell Rate

B

BE	Bridged Ethernet
BER	Bit Error Ratio (Rate)
B-ICI	Broadband Inter-Carrier Interface
B-ISDN	Broadband Integrated Services Digital Network

BOOTP Boot Protocol

BUS Broadcast and Unknown Server

C

CAC Call Admission Control

CAN Campus Area Network

CAT-3 Category 3 unshielded twisted pair cable

CAT-5 Category 5 unshielded twisted pair cable

CBR Constant Bit Rate

CCITT Comite Consultatif Internationale de Telegraphique et Telephonique (Consultative Committee on International Telegraphy and Telephony)

CCR Current Cell Rate

CDV Cell Delay Variation

CER Cell Error Ratio

CES Circuit Emulation Service

CI Congestion Indicator

CLP Cell Loss Priority

CLR Cell Loss Ratio

CMIP Common Management Information Protocol

COM Communication

COS Class of Service

CPE Customer Premise Equipment

CPU Central Processing Unit

CRC Cyclic Redundancy Check

CRS Cell Relay Service

CS Convergence Sublayer

CTD Cell Transfer Delay

D

DCC	Digital Cross Connect, generic DACS or Direct Connect Card, data interface module
DF	Download Flash
DS-0	Digital Signaling 0
DS-1	Digital Signaling 1
DS-3	Digital Signaling 3
DTE	Data Terminal Equipment
DTL	Designated Transit List
DVT	Delay Variation Tolerance

E

E-1	European standard for digital transmission service at 2 Mb/s.
E-3	European standard for digital transmission service at 34.4 Mb/s (transports 16 E1 circuits)
E-NET	Ethernet
EFCI	Explicit Forward Congestion Indicator
EISA	Extended Industry Standard Architecture
ELAN	Emulated Local Area Network
EMI	Electro-Magnetic Interference
ENR	Enterprise Network Roundtable
EOF	End of Frame
EPD	Early Packet Discard
EPROM	Erasable Programmable Read-Only Memory
ESD	Electro-Static Device
ESI	End System Identifier
ESM	Expansion Switch Module

F

FCS	Frame Check Sequence
FIFO	First In First Out
FTP	File Transfer Protocol

G

GB/S	Gigabits per second
GCAC	Generic Call Admission Control
GCRA	Generic Cell Rate Algorithm
GFC	Generic Flow Control

H

HEC	Header Error Check

I

IEEE	Institute of Electrical and Electronic Engineers
ICMP	Internet Control Message Protocol
ID	Identification Number
IE	Information Element
IETF	Internet Engineering Task Force
IISP	Interim Inter-Switch Signaling Protocol

ILMI Integrated Local Management Interface

I/O Input/Output

IOM Input/Output Module

IP Internet Protocol

IP/ATM Internet Protocol over ATM

IPX Internetwork Packet Exchange protocol

ITU-TSS International Telecommunications Union-Telecommunications Standards Sector

ISDN Integrated Service Digital Network

J

JPEG Joint Photographic Experts Group

K

KB/S Kilobits per second

L

LAN Local Area Network

LANE LAN Emulation

LE LAN Emulation

LE-ARP LAN Emulation-Address Resolution Protocol

LEC LANE Client

LECS LAN Emulation Configuration Server

LECSELAN LAN Emulation Configuration Server Emulated LAN

LES LANE Server

LESELAN LANE Server Emulated LAN

LIS Logical IP Subnetwork

LLC Logical Link Control

LMI Local Management Interface

M

MAC Media Access Control

MAN Metropolitan Area Network

MB/S Megabits per second

MBS Maximum Burst Size

MCR Minimum Cell Rate

MIB Management Information Base

MMF Multi-Mode Fiber

MP Multi-Point

MSM Main Switch Module

MTU Maximum Transfer Unit

N

NAKS Negative Acknowledges

NDIS Network Driver Interface Specification

NETBEUI NetBIOS Extension User Interface

NFS Network File System

NIC Network Interface Controller/Card

NLS Natural Language Syntax

NMS Network Management System

NNI Network Node Interface or Network-to-Network Interface

NRT-VBR Non Real Time - Variable Bit Rate

NRZ Non-Return to Zero

NSAP Network Services Access Point

O

OAM Operations and Maintenance

OAM&P Operations, Administration, Maintenance and Provisioning

OC-1 Optical Carrier 1

OC-N Optical Carrier n (where "n" is an integer)

ODI Open Data-link Interface

OOB Out of Band

OSI Open Systems Interconnection

P

PC Personal Computer

PC Priority Control

PCI Peripheral Component Interconnect

PCR Peak Cell Rate

PDU Protocol Data Unit

PGL Peer Group Leader

PMD Physical Media Dependent Sub-layer

PMP Point-to-Multipoint

P-NNI Private Network Node Interface or Private Network-to-Network Interface

PPD Partial Packet Discard

PROM Programmable Read-Only Memory

PTI Payload Type Indicator

PTP Point-to-Point

PTSE PNNI Topology State Element

PTSE PNNI Topology State Packet

PVC Permanent or Provisioned Virtual Circuit

Q

QOS Quality of Service

QSAAL Q-Signaling ATM Adaptation Layer. (Q represents the Q-series of the ITU-T (International Telecommunications Union).

R

R Read-Only Access

RAM Random Access Memory

RCC Routing Control Channel

RCR Raw Cell Received

RD Receive Deactivated

RFC Request for Comment

RM Resource Management

RMA Return Merchandise Authorization

RQU Receive Queue Underrun

RS-# Recommended Standard defined by Electronic Industries Association

RT-VBR Real Time - Variable Bit Rate

RW Read-Write Access

S

SAAL Signaling ATM Adaptation Layer

SAR Segmentation And Reassembly

SAR-PDU SAR Protocol Data Unit

SBE System Bus Error

SCR Sustainable Cell Rate

SDH Synchronous Digital Hierarchy

SEAL Simple Efficient Adaptation Layer

SMF Single Mode Fiber

SMDS Switched Multimegabit Data Service

SNMP Simple Network Management Protocol

SONET Synchronous Optical Network

STM-1 Synchronous Transport Module 1

STM-N Synchronous Transport Module n (where ‘n' is an integer)

STM-NC Synchronous Transport Module n - concatenated (where ‘n' is an integer)

STP Shielded Twisted Pair

STS-1 Synchronous Transport Signal 1

STS-N Synchronous Transport Signal n (where ‘n' is an integer)

STS-NC Synchronous Transport Signal n - concatenated (where ‘n' is an integer)

SVC Switched Virtual Circuit

SVCC Switched Virtual Channel Connection

T

T-1 Transmission System 1

T-3 Transmission System 3

TAXI Transparent Asynchronous Transmitter/Receiver Interface

TCP Transmission Control Protocol

TD Traffic Descriptor

TDM Time-Division Multiplexing

TFTP Trivial File Transfer Protocol

TLV Type, Length and Value

U

UBR Unspecified Bit Rate

UME UNI Management Entity

UNI User-Network Interface

UP Unnumbered Poll

UPC Usage Parameter Control

UTOPIA Universal Test and Operations Physical Interface for ATM

UTP Unshielded Twisted Pair

V

VBR/RT	Variable Bit Rate/Real Time
VBR/NRT	Variable Bit Rate/Non-real Time
VC	Virtual Circuit
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VCL	Virtual Channel Link
VLAN	Virtual LAN
VP	Virtual Path
VPC	Virtual Path Connection
VPI	Virtual Path Identifier
VPN	Virtual Private Network
VT	Virtual Tributary

W

WAN	Wide Area Network

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ZeitNet Cabletron proprietary MIBs B-2